Stormwater Management Design Report for:

1016-1018 Doering Street
Township of Wellesley

GMBP File: 418223

March 2021

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STORMWATER MANAGEMENT DESIGN REPORT

1016-1018 DOERING STREET

TOWNSHIP OF WELLESLEY

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1. INTRODUCTION

This report has been prepared by GM BluePlan Engineering Limited to document the stormwater management system in support of the Draft Plan of Condominium Application for the proposed residential development located at 1016-1018 Doering Street in the Township of Wellesley.

The Owner is required to have a Professional Engineer design a stormwater management system and have the said Engineer supervise and certify that the stormwater management system was installed in accordance with the approvals given under Section 41 of the Planning Act.

The topographic survey of the site was completed by Van Harten Surveying Inc. (dated June 28, 2019). The existing and proposed site details are shown on the Existing Conditions Plan and Site Servicing and Grading Plan (GM BluePlan Engineering Limited Drawing No. 1-2). The proposed layout of the development was provided by GSP Group Inc. (dated February 25, 2021)

2. SITE INFORMATION

The 4.3-hectare site is bound by residential development to the north, Firella Creek to the east and south, and existing residential development to the west. The intent of the Owner at this time is to maintain two (2) existing dwellings and develop forty-eight (48) semi-detached and townhouse residences along with the associated parking and landscaped areas. The existing lot at 1030 Doering Street is proposed to be severed as part of the Condominium Plan.

3. STORMWATER MANAGEMENT DESIGN

3.1 Stormwater Management Criteria

A summary of the stormwater management design criteria to be applied to the development are as follows:

1. Stormwater Management shall be developed in accordance with the Firella Creek Master Drainage Plan, including:
    a. Control of the 25mm rainfall event (peak flows and volumes) for erosion control
    b. Control of peak flows for the 5 to 100-year design storm events
    c. Provide quality control for Firella Creek main branch
2. The post-development peak runoff generated from the site is to be attenuated to the existing condition/pre-development level, for the full range of design storm events up to and including the 100-year design storm.
3. Enhanced water quality treatment (80% TSS total suspended solids removal) is to be provided prior to the discharge of runoff from the site.
4. Major storm flows are to be routed overland to an appropriate outlet.

The Chicago Rainfall Distribution parameters, intensity and depth of rainfall for the 25mm, 5, 10, 25, 50 and 100-year design storm events analysis are as follows:

Table No. 1: Township of Wellesley IDF Curve Parameters (Chicago Rainfall Distribution)

	25 mm	5-Year	10-Year	25-Year	50-Year	100-Year
a =	509	1,593.00	2,221.00	3,158.00	3,886.00	4,688.00
b =	6.0	11.0	12.0	15.0	16.0	17.0
c =	0.7989	0.8789	0.9080	0.9355	0.9495	0.9624
r=	0.375	0.375	0.375	0.375	0.375	0.375
Duration (minutes) =	180	180	180	180	180	180

A geotechnical report completed by Chung and Vander dated on December 5, 2019 was completed for the site. The borehole logs concluded that the soils generally ranged from clayey-silt to silt, underlain by a sand till. The Geotechnical report has been appended to **Appendix A**. As such, the Horton Infiltration Method was used in the runoff calculations. The parameters used in the MIDUSS V2.25 are as follows:

Table No. 2: Horton Infiltration Parameters

	IMPERVIOUS AREAS	PERVIOUS AREAS
Maximum Infiltration	0.0 mm/hr	6.0 mm/hr
Minimum Infiltration	0.0 mm/hr	1.0 mm/hr
Lag Constant	0.05 hr	0.25 hr
Depression Storage	1.5 mm	5.0 mm

The hydrologic model MIDUSS V2.25 was used to create the runoff hydrographs and to route the flows through the storage structures.

Note that because of the poor permeability of the existing condition soils, as well as the high groundwater table in some areas, infiltration swales have not been included in the proposed design. Correspondence with Chung & Vander Doelen Engineering Ltd. referring to the on-site soils and the permeability has been included in **Appendix A**.

4. ANALYSIS RESULTS

4.1 Existing Condition Analysis

For analysis purposes, the existing condition on the site was modelled as three (3) drainage catchments. The pre-development catchment Area plan is included in Appendix B. The pre-development modelling schematic and modelling output is included in **Appendix C**.

Catchment 100 (1.70-hectares, 10% Impervious) represents the existing condition of the developable portion of site, including the existing residential dwelling, buildings, existing asphalt and gravel areas, and landscaped

areas. Under existing conditions, runoff generated from Catchment 100 sheetflows overland towards Firella Creek.

Catchment 400 (0.38-hectares, 30% Impervious) represents the existing residential dwellings fronting Doering Street, including existing buildings and landscaped areas. Under existing conditions, runoff generated from Catchment 400 sheetflows overland in a southeasterly direction, ultimately discharging to Firella Creek.

Catchment 401 (0.66-hectares, 20% Impervious) represents the existing rear yards of the residential dwellings fronting Nafziger Road, including existing buildings and a portion of the landscaped areas. Under existing conditions, runoff generated from Catchment 400 sheetflows overland in a southeasterly direction, ultimately discharging to Firella Creek.

In summary, the existing condition flow rates are as follows:

Table No. 3: Existing Condition Flow Rates

	25mm (m^3/s)	5-Year (m^3/s)	10-Year (m^3/s)	25-Year (m^3/s)	50-Year (m^3/s)	100-Year (m^3/s)
Catchment 100	0.136	0.468	0.594	0.687	0.794	0.899
Catchment 400	0.040	0.103	0.128	0.151	0.170	0.189
Catchment 401	0.068	0.185	0.227	0.263	0.294	0.333
Total	**0.234**	**0.756**	**0.949**	**1.100**	**1.258**	**1.415**

4.2 Allowable Release Rate

Per the City of Kitchener Stormwater Management Criteria for the site, post-development flows are to be attenuated to pre-development levels. The allowable release rates for the site are as follows:

Table No. 4: Post Development Flow Rates

	25mm (m^3/s)	5-Year (m^3/s)	10-Year (m^3/s)	25-Year (m^3/s)	50-Year (m^3/s)	100-Year (m^3/s)
Allowable Release Rate	0.234	0.756	0.949	1.100	1.258	1.415

4.3 Post-Development Condition Analysis

For analysis purposes, the site was modelled as fifteen (15) drainage catchments. The drainage catchment used in the analysis is shown on the Post Catchment Area Plan in **Appendix B**.

Catchment 200 (0.90-hectares, 70% Impervious) represents a portion of the site's development area. Runoff generated from Catchment 200 will be captured by the storm sewer system and will also be attenuated by the storm tank and refurbished pond.

Catchment 201 (0.24-hectares, 65% Impervious) represents a portion of the site's landscape area. Runoff generated from Catchment 201 will be directed to grassed swales that will ultimately be captured by the storm sewer system and will also be attenuated by the storm tank and refurbished pond.

Catchment 202 (0.26-hectares,60% Impervious) represents a portion of the site's landscape area. Runoff generated from Catchment 202 will sheetflow uncontrolled overland towards Firella Creek.

Catchment 203 (0.07-hectares, 50% Impervious) represents a portion of the site's landscape area. Runoff generated from Catchment 203 will be directed to grassed swales that will ultimately be captured by the storm sewer system and will also be attenuated by the storm tank and refurbished pond.

Catchment 204 (0.09-hectares, 45% Impervious) represents a portion of the site's landscape area. Runoff generated from Catchment 204 will be directed to grassed swales that will ultimately be captured by the storm sewer system and will also be attenuated by the storm tank and refurbished pond.

Catchment 205 (0.04-hectares, 50% Impervious) represents a portion of the site's landscape area. Runoff generated from Catchment 204 will be directed to grassed swales that will ultimately be captured by the storm sewer system and will also be attenuated by the storm tank and refurbished pond.

Catchment 206 (0.13-hectares, 0% Impervious) represents portions of the site's landscaped area. Runoff generated from Catchment 206 will sheetflow uncontrolled, ultimately draining into the Firella Creek.

Catchment 300 (0.37-hectares, 41% Impervious) represents external area where runoff is entering the site. Runoff from Catchment 300 will be conveyed through Catchment 201 into the proposed storm sewer system where the runoff and will also be attenuated by the storm tank and refurbished pond.

Catchment 301 (0.01-hectares, 0% Impervious) represents external area where runoff is entering the site. Runoff from Catchment 301 will be conveyed through Catchment 203 into the proposed storm sewer system where the runoff and will also be attenuated by the storm tank and refurbished pond.

Catchment 302 (0.25-hectares, 0% Impervious) represents external area where runoff is entering the site. Runoff from Catchment 302 will be conveyed through Catchment 204 into the proposed storm sewer system where the runoff and will also be attenuated by the storm tank and refurbished pond.

Catchment 303 (0.03-hectares, 0% Impervious) represents external area where runoff is entering the site. Runoff from Catchment 303 will be conveyed through Catchment 205 into the proposed storm sewer system where the runoff and will also be attenuated by the storm tank and refurbished pond.

Catchment 304 (0.09-hectares, 45% Impervious) represents external area and right of way runoff is entering the site. Runoff from catchment 304 will be conveyed uncontrolled towards Firella Creek.

Catchment 305 (0.02-hectares, 0% Impervious) represents external area where runoff is entering the site. Runoff from Catchment 305 will be conveyed through Catchment 206 towards Firella Creek.

Catchment 306 (0.07-hectares, 7% Impervious) represents external area where runoff is entering the site. Runoff from Catchment 306 will be conveyed through Catchment 200 towards the proposed storm sewer system where the runoff and will also be attenuated by the storm tank and refurbished pond.

Catchment 307 (0.18-hectares, 21% Impervious) represents external area where runoff is entering the site. Runoff from Catchment 307 and will also be attenuated by the storm tank and refurbished pond.

Quality control treatment for the site (Enhanced, 80% TSS Removal) will be provided via an on-site oil/grit separator unit (First Defense – 4HC) prior to discharge from the site. Details on the proposed oil/grit separator have been included in Appendix D. In addition, to provide a treatment train, runoff will be conveyed through grassed swales and vegetated areas, as well as catchbasins and catchbasin manholes that will include a sump for sediment control and the outlet pipe will distribute to a rip-rap surface for final polishing.

The proposed underground storage tank is approximately 535m^2 and 0.6m and will provide a total storage of 476 m^3. The existing pond has been regraded to provide approximately 120m^3 of additional storage. Runoff is controlled by a downstream multi-staged orifice located in DCBMH1. An orifice plate with 0.3m and 0.6m holes at elevations of 348.71m and 349.11m respectively, controls the peak flow rates from post to pre-development levels.

4.4 Routing

The hydrologic model MIDUSS was used to create the design storm runoff hydrographs and to route the hydrographs. A copy of the final printout of the hydrologic modelling is appended in **Appendix C**.

The results of the routing analysis are as follows:

Table No. 5: Underground Storage Tank & Refurbished Pond Stage/Storage/Discharge Capacities

	Available Capacity			Actual Capacity Used		
	Peak Flow m^3/s	Storage Volume m^3	Stage m	Peak Flow m^3/s	Storage Volume m^3	Stage m
Orifice Invert	0.000	0.0	348.71	-	-	-
Bottom of Tank	0.0713	9.0	349.44	-	-	-
25mm	-	-	-	0.188	50.51	349.514
5-Year	-	-	-	0.343	212.42	349.806
10-Year	-	-	-	0.394	291.44	349.949
Top of Tank & Grate (DCBMH.1)	0.4298	352.88	350.06	-	-	-
25-Year	-	-	-	0.446	376.34	350.115
Bottom of Active Storage in Pond	0.4448	371.70	350.11	-	-	-
50-Year	-	-	-	0.466	459.82	350.189
Weir	0.4704	477.16	350.21	-	-	-
100-Year	-	-	-	0.604	478.43	350.312
Overflow	0.9386	478.52	350.32	-	-	-

In summary, the post-development flow rates from the site are as follows:

Table No. 6: Post Development Flow Rates

	25mm (m^3/s)	5-Year (m^3/s)	10-Year (m^3/s)	25-Year (m^3/s)	50-Year (m^3/s)	100-Year (m^3/s)
Catchments 200, 201, 203, 204, 205, 300, 301, 302, 303, 306 and 307 (controlled)	0.188	0.343	0.394	0.446	0.466	0.604
Catchment 202 (uncontrolled)	0.036	0.082	0.100	0.114	0.129	0.144
Catchment 206 (uncontrolled)	0.013	0.038	0.048	0.056	0.063	0.070
Catchment 304 (uncontrolled)	0.009	0.025	0.032	0.037	0.043	0.048
Catchment 305 (uncontrolled)	0.002	0.006	0.007	0.009	0.010	0.011
Total Post-Development Flow Rate	**0.233**	**0.441**	**0.516**	**0.587**	**0.649**	**0.735**

4.4.1 Comparison of Allowable and Post-Development Flow Rates

The following table summarises the post-development condition flows and allowable release rates for the site.

Table No. 7: Comparison of Allowable and Post-Development Flow Rates

	25mm (m^3/s)	5-Year (m^3/s)	10-Year (m^3/s)	25-Year (m^3/s)	50-Year (m^3/s)	100-Year (m^3/s)
Total Post-Development Flow Rate	0.233	0.441	0.516	0.587	0.649	0.735
Allowable Release Rate	0.234	0.756	0.949	1.100	1.258	1.415

Therefore, the proposed development has little to no impact on the post-development flow rates from the site. Allowable release rate flow rates have been achieved for the post-development condition.

4.4.2 Thermal Mitigation

The GRCA has noted that the receiving water course, Firella Creek, is part of a coldwater thermal regime. As such, elements of the design and concept should attempt to mitigate an increase in temperature of the stormwater runoff.

Provided that the stormwater storage is predominantly underground, and a large amount of runoff is conveyed through vegetated areas with substantial tree coverage to provide shade and assist in reducing the temperature of the stormwater runoff. It is not anticipated that a significant increase in temperature to the stormwater runoff will occur as it is conveyed within the proposed storm sewer system.

5. MAINTENANCE PLAN

To ensure that the stormwater management system continues to function as designed and constructed, we recommend that the following inspections and maintenance activities be completed on an annual basis:

1. Is there any indication of a spill (i.e. frothy water, oily sheen on the water)? If yes, investigate, inform the appropriate agencies and complete the necessary clean-up and restoration.
2. Inspect all snouts, and flow control orifice plates. Remove and dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves, etc.).
3. Inspect all catch basins, and manholes. Remove and dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves, etc.).
4. Inspect all swales and overflow locations. Remove and dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves. etc.).

Please note that any structures identified during the annual inspection to be worn, missing or damaged are to be repaired or replaced within 48 hours.

6. SEDIMENT AND EROSION CONTROL

Silt fence will be installed along the are of impact in all locations where runoff will discharge from the construction zone to adjacent lands and other areas of the site. The silt fence will serve to minimize the opportunity for water borne sediments to be washed on to the adjacent properties.

Once manholes and catch basins have been installed, the grates will be wrapped with filter cloth. This feature will be maintained until all building and landscaping has been completed.

Inspection and maintenance of all silt fencing will start after installation is complete. The silt fence will be inspected on a weekly basis during active construction or after a rainfall event of 13 mm or greater. Maintenance will be carried out, within 48 hours, on any part of the facility found to need repair.

Once construction and landscaping has been substantially completed, the silt fence will be removed, any accumulated sediment will be removed, and the landscaping will be completed.

After construction of the complete development, erosion and sediment transport will be minimal.

7. CONCLUSIONS

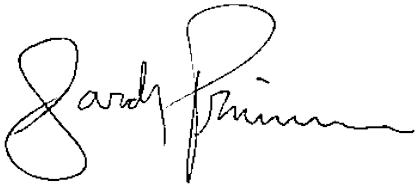
In summary, the following conclusions are drawn:

1. The post-development flow rates for the 25mm, 5, 10, 25, 50 and 100-year design storm events have been attenuated to pre-development levels.
2. Major storm runoff generated from the site is directed to an appropriate outlet.
3. Enhanced water quality control treatment (80% TSS removal) will be provided for the development through a treatment train approach, including an oil/grit separator unit, grassed swales, and sumps within the conveyance structures.
4. Prior to construction, a silt fence will be installed along the construction area in all locations where runoff will discharge from the site to adjacent lands. This will minimize the transport of sediment off-site during the construction period.

All of which is respectfully submitted.

GM BLUEPLAN ENGINEERING LIMITED

Per:



Sarah Primmer, P.Eng.

SP/MS

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APPENDIX A

Geotechnical Report (Chung and Vander Doelen Engineering Ltd., (December 5, 2019) and Existing Soil Permeability Conditions

Muaadh Solomah - GM BluePlan

To: Sarah Primmer - GM BluePlan
Subject: RE: Doering Street - Draft Plan of Condominium Application - 418223

Hi Sarah,

The enclosed geotechnical report covers the entire proposed subdivision.

The predominant soil deposit at the site is a clayey silt. Based on the results of grain size analyses and our experience, the hydraulic conductivity and infiltration rate are estimated and provided in the following table and may be used for storm water management purposes:

MATERIAL	PERMEABILITY (K) (cm/sec)	INFILTRATION RATE (mm/hr)
Clayey Silt	1×10^{-6}	1

Give me a call if you have any questions.

ERIC CHUNG, M.Eng., P.Eng.
PRINCIPAL ENGINEER
CHUNG & VANDER DOELEN ENGINEERING LTD.
311 VICTORIA STREET NORTH / KITCHENER / ONTARIO / N2H 5E1
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CHUNG & VANDER DOELEN
ENGINEERING LTD.

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
1016, 1018, 1024, 1030 & 1032 Doering Street
Wellesley, Ontario

SUBMITTED TO:
Jim Flynn
66 Schweitzer Crescent
Wellesley, Ontario
N0B 2T0

ATTENTION:
Mr. Jim Flynn

FILE NO /G18713**/**December 5, 2019

CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

December 5, 2019
File No.: G18713

Jim Flynn
66 Schweitzer Crescent
Wellesley, Ontario
N0B 2T0

Attention: Mr. Jim Flynn

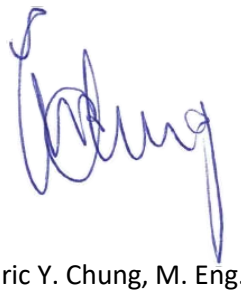
RE: Geotechnical Investigation
Proposed Residential Development
1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario

We take pleasure in enclosing one (1) copy of our Geotechnical Investigation Report carried out at the above-referenced Site. Soil samples will be retained for a period of three (3) months and will thereafter be disposed of unless we are otherwise instructed.

If you have any questions or clarifications are required, please contact the undersigned at your convenience.

We thank you for giving us this opportunity to be of service to you.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.



Eric Y. Chung, M. Eng., P.Eng.
Principal Engineer

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LIST OF ENCLOSURES

1.0 INTRODUCTION

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) has been retained by Mr. Jim Flynn to carry out a geotechnical investigation for the proposed residential development proposed at 1016, 1018, 1024, 1030 & 1032 Doering Street in Wellesley, Ontario.

The existing residential dwellings at the site are not to be demolished as part of the development, however, three (3) sheds at Residences No. 1030 and 1032 are to be removed.

It is understood that the proposed development will consist of one (1) single detached home and eleven (11) townhome blocks up to 2-stories high with walkout/lookout basements. An internal roadway is proposed throughout the development and will connect to Doering Street at two (2) locations, at the eastern dead end and just west of the residence at address no. 1030. Two (2) visitor parking areas are proposed in the centre and northeast corner of the site. Finished first floor elevations at the various residential units are proposed between 351.38 and 357.82 m. Site grading and engineered fill placement will be required.

The purpose of this investigation was to determine the subsurface conditions at the site and, based on the findings, to make geotechnical recommendations for:

- Foundation design recommendations;
- Excavation condition;
- Groundwater control during construction;
- Basement condition;
- Site grading and engineered fill construction;
- Backfilling recommendations;
- Foundation soil classification seismic design per OBC 2012; and
- Slope stability assessment

2.0 FIELD WORK

In order to investigate the subsurface conditions at the site, eleven (11) boreholes were advanced to depths between 5.03 and 8.05 m below ground surface on January 23, 2019 as part of an initial investigation and on August 26 and 27, 2019 due to site expansion. The borehole locations are indicated on the Borehole Location Plan, Drawing No. 1.

The field work was carried out under the supervision of a member of our engineering team, who logged the boreholes in the field, effected the subsurface sampling, and monitored the groundwater conditions. The boreholes were advanced using a track-mounted drilling rig, supplied and operated by a specialized contractor. The drill rig was equipped with continuous flight augers and standard soil sampling equipment. Standard penetration tests (SPTs) in accordance with ASTM Specification D1586, were carried out at frequent intervals of depth, and the results are shown on the Borehole Logs as Penetration Resistance or “N”-values. The undrained shear strength of the cohesive soil deposit was

determined on the slightly disturbed SPT samples using a field pocket penetrometer. The compactness condition or consistency of the soil strata has been inferred from these test results.

Monitoring wells were installed in Boreholes 2, 5, 6 and 10 to allow for long term monitoring of the groundwater condition. As part of a Phase II Environmental Site Assessment (ESA) investigation by CVD, a monitoring well (ESA-BH 7) was installed within one of the building footprints near Borehole 11.

Well response tests (slug tests) were completed on the five (5) monitoring wells to determine the hydraulic conductivity (or permeability) of the geologic materials located at the water table. The data was analyzed using Aquifer Test software and the data and graphical analyses are provided in Appendix C.

The borehole locations were established on site by CVD. Ground surface elevations at Boreholes 1 to 5 were surveyed by Van Harten Surveying Inc. as part of the topographic survey on January 17, 2019. Ground surface elevations at Boreholes 6 to 11 were surveyed by CVD and the elevations were referenced to a temporary benchmark (TBM) which is shown on Drawing No. 1and described below:

TBM: Top of manhole in Doering Street in front of Residence No. 1024, as shown on Drawing No. 1

Elevation: 352.41 m (Geodetic)

3.0 LABORATORY TESTING

Soil samples obtained from the in-situ tests were examined in the field and subsequently brought to our laboratory for visual and tactile examination to confirm field classification. Moisture content determination of all retrieved samples occurred.

In addition, four (4) grain size distribution analyses and two (2) sets of Atterberg Limits were performed on the major soil deposits to confirm field identification and to provide information on the soil properties.

4.0 EXISTING SITE CONDITIONS

The site is located at the end of Doering Street in Wellesley, Ontario. The site is irregular in shape and is bound to the east by Firella Creek, to the west by existing residences, to the north by existing residences and Doering Street and to the south by green space. The site surrounds the residence at 1032 Doering Street to the north, south and east along the western property limit.

The site is occupied by three (3) single-storey residences along Doering Street located at Residences No. 1016, 1018 and 1030 and two (2) sheds at Residence No. 1032. An extended driveway is located along the western property line and extends to sheds at Residence No. 1032. There is an existing pond

located immediately to the south of a canvas-covered shed. The remainder of the site is grass-covered with many mature trees scattered throughout.

The site is terraced with an approximate 1 to 2 m high curving bank which dissects the site along its length. The ground surface of the upper terrace slopes downwards in a southeasterly direction. The highest ground on the upper terrace is located in the northwestern portion of the site, in the area of Residence No. 1030, with a ground surface elevation at approximately 356.0± m and slopes down to approximately 348.5± m, the lowest elevation on the upper terrace. A second 1 to 2 m high steep bank runs along the bottom of the lower terrace and the bank of Firella Creek. The elevation at the bottom of the lower bank is between 345.8± and 346.3± m.

The ground surface elevations at the borehole locations ranged between 349.01 and 355.89 m.

5.0 SUBSURFACE CONDITIONS

The detailed subsurface conditions encountered in the eleven (11) boreholes advanced as part of this investigation are shown on the Borehole Log Sheets, Enclosures 1 to 11 and the borehole log from the Phase II ESA investigation is shown in Appendix B. The following sections provide descriptions of the major soil deposits encountered in the boreholes.

The stratigraphic boundaries shown on the borehole logs are inferred from non-continuous sampling conducted during advancement of the borehole drilling procedures and, therefore, represent transitions between soil types rather than exact planes of geologic change. The subsurface conditions will vary between and beyond the borehole locations.

5.1 Topsoil

A layer of topsoil was encountered at ground surface at Boreholes 1 to 11 with a measured thickness between 100 and 380 mm.

5.2 Fill

A layer of fill materials was encountered below the topsoil in Boreholes 2 to 9 and 11. The fill layer extended to depths between 0.36 to 3.36 m below ground surface. Fill materials may exist at greater depths in the areas of existing structures and foundations.

The non-cohesive fill materials at Boreholes 1, 2, 4 to 8, 10 and 11 were comprised of varying amounts of sand and silt in the range of sand with trace silt to sandy silt, with trace to some gravel and trace clay. Underlying the silty sand fill at Borehole 7 was a layer of sand and gravel fill with trace to some silt. Occasional silty layers and cobbles were observed within the sand and gravel fill at Borehole 7. Occasional clayey seams were observed at Borehole 8. The SPT “N”-values measured within the non-cohesive fill materials ranged from 3 to 26 blows per 300 mm of penetration, indicating a very loose to compact compactness condition.

The cohesive fill materials at Boreholes 3 and 9 were comprised of clayey silt with some sand and trace gravel. A layer of buried topsoil was found near the bottom of the fill materials in Borehole 3. The SPT “N”-values measured within the cohesive fill materials ranged from 3 to 10 blows per 300 mm of penetration, indicating a soft to stiff consistency.

Trace to some topsoil/organics were observed within the fill at Boreholes 3, 6 to 9 and 11. The measured water content of the samples collected ranged between 2 and 23%, thus indicating damp to saturated moisture condition.

5.3 Clayey Silt

A deposit of clayey silt was encountered below the topsoil at Boreholes 1 and 10 and underlying the fill materials at Boreholes 2 to 9 and 11. Where fully penetrated in Boreholes 1, 2, 10 and 11, the deposit extended to depths between 3.96 and 5.49 m below existing grades. Boreholes 3 to 9 were terminated within this deposit to depths between 6.55 and 8.05m below ground surface. The clayey silt deposit contained trace to some sand, trace gravel. Occasional to frequent silt seams were observed throughout the deposit. An intermittent silt layer was encountered within the clayey silt in Borehole 3 at depths between 2.1 and 2.9 m. Results of two (2) grain size distribution analyses from Boreholes 3 and 5 are shown graphically on Enclosures 14 and 15.

The SPT "N"-values measured within the deposit ranged from 6 to 29 blows per 300 mm of penetration. The undrained shear strength obtained on the retrieved samples ranged from 24 kPa to over 250 kPa. Based on the above test results and tactile examination, the clayey silt is considered to have a firm to very stiff consistency. The measured water content of the samples collected ranged between 16 and 29%, thus indicating a moist to wet moisture condition.

Appendix C provides analyses of well response test (slug test) data collected on November 15, 2019 from wells at Boreholes 2, 5, 6, 10 and ESA-Borehole 7. These analyses indicate the hydraulic conductivity (permeability) of the predominant clayey silt soil beneath the property is in the $3x10^{-7}$ to $6x10^{-6}$ cm/sec range. This indicates that groundwater flow through this material (both vertical and horizontal) will be very slow.

5.4 Silt

A silt deposit containing trace amounts of sand and clay was encountered underlying the clayey silt deposit at Borehole 2 and 10 and within the clayey silt deposit at Borehole 4. The deposit extended to depths of 5.49 and 6.86 m below ground surface at Boreholes 2 and 10, respectively. The silt deposit at Borehole 4 was encountered between 2.1 and 2.9 m depth. Occasional clayey seams were observed within the deposit at Boreholes 2 and 10. Results of one (1) grain size distribution analysis from Boreholes 2 is shown graphically on Enclosure 12.

The SPT "N"-values measured within the deposit ranged from 15 to 41 blows per 300 mm of penetration, indicating a compact to dense compactness condition. The measured water content of the samples collected ranged between 15 and 19%, thus indicating a saturated moisture condition.

5.5 Sand

A sand deposit containing some gravel and trace silt was encountered below the clayey silt deposit at Borehole 1. Borehole 1 was terminated within the sand deposit at a depth of 5.03 m.

The SPT "N"-value measured within this layer was 25 blows per 300 mm of penetration, indicating a compact compactness condition.

5.6 Sand and Silt Till

A deposit of sand and silt till was encountered below the silt deposit at Boreholes 2 and 10 and underlying the clayey silt deposit at Borehole 11. All three (3) Boreholes were terminated within the deposit at depths between 6.38 and 7.30 m below existing grades. The deposit contained trace to some gravel and trace clay. Occasional cobbles were observed within the deposit at Borehole 10. Results of one (1) grain size distribution analysis from Boreholes 1 is shown graphically on Enclosure 13.

The SPT "N"-values measured within the deposit ranged from 57 blows per 300 mm to 50 blows per 125 mm of penetration, indicating a very dense compactness condition. The measured water content of the samples collected ranged between 8 and 10%, thus indicating a moist moisture condition.

5.7 Groundwater

Groundwater conditions were monitored during and following completion of borehole sampling. Monitoring wells were installed in Boreholes 2, 5, 6 and 10. In addition, as part of a concurrent Phase II Environmental Site Assessment (ESA) investigation by CVD, a monitoring well (ESA-BH 7) was installed near Borehole 11. The table below summarizes the water level readings in the monitoring wells:

Borehole No.	Ground Surface Elevation (m)	Date	Water Level Below Existing Ground Surface (m)	Water Level Elevation (m)
2	349.52	January 30, 2019	0.32	349.20
		March 8, 2019	0.36	349.16
		September 4, 2019	0.74	348.78
		November 15, 2019	0.41	349.11
5	351.16	January 30, 2019	0.99	350.17
		March 8, 2019	0.88	350.28
		September 4, 2019	3.00	348.16
		December 4, 2019	1.70	349.46
6	355.89	September 4, 2019	5.15	350.74
		December 4, 2019	1.58	354.31
10	350.61	September 4, 2019	0.82	349.79
		November 15, 2019	0.56	350.05
ESA-7	352.08	September 4, 2019	1.26	350.82
		November 15, 2019	0.70	351.38

The water level measured in the monitoring wells ranged in depths between 0.32 and 5.15 m, corresponding to elevations 348.16 and 354.31 m. The water levels observed during and following the completion of drilling at Boreholes 1, 3, 4, 7 and 11 ranged between 2.7± and 6.1± m below ground surface and Boreholes 8 and 9 remained dry. The water levels observed in the open boreholes upon completion of drilling does not represent stabilized groundwater levels.

It is noted that the observed groundwater table will fluctuate seasonally and in response to major weather events.

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 General

The existing residential dwellings at the site are not to be demolished as part of the development, however, three (3) sheds at Residences No. 1030 and 1032 are to be removed.

It is understood that the proposed development will consist of one (1) single detached home and eleven (11) townhome blocks up to 2-stories high with walkout/lookout basements. An internal roadway is proposed throughout the development and will connect to Doering Street at two (2) locations, at the eastern dead end and just west of the residence at address no. 1030. Two (2) visitor parking areas are proposed in the centre and northeast corner of the site. Finished first floor elevations at the various residential units are proposed between 351.38 and 357.82 m. Site grading and engineered fill placement will be required.

In general, the surficial topsoil was underlain by fill materials followed by a major deposit of firm to very stiff clayey silt. The clayey silt was in turn underlain by compact to very dense silt, sand, and sand and silt till deposits.

The water level measured in the monitoring wells ranged in depths between 0.32 and 5.15 m, corresponding to elevations 348.16 and 354.31 m. The water levels observed during and following the completion of drilling at Boreholes 1, 3, 4, 7 and 11 ranged between 2.7± and 6.1± m below ground surface and Boreholes 8 and 9 remained dry. The water levels observed in the open boreholes upon completion of drilling does not represent stabilized groundwater levels.

Based on the proposed finished floor elevations of the residential units, the finished first floor levels will lie above the observed high groundwater table. Assuming a depth of 3.2± m for proposed walkout/lookout basements, basement finished floor elevations will lie 0.7± to 2.0± m below the seasonal high groundwater table in the areas of lots 3 to 19 and 29 to 48. However, due to the very low permeability of the native clayey silt soils, basements can still be constructed below the groundwater table with a conventional weeping tile and sump pump drainage system implemented at each townhome block.

It may be necessary to install an underfloor drainage system in these townhome blocks to efficiently convey the water to the sumps. It is recommended that at least one (1) sump pit should be installed in every 3 units. Positive grade adjacent to the basement will direct surface water away from the building, preventing surface water infiltration.

6.2 Footing Foundations

Conventional strip and spread footing foundations can be used to support the proposed low rise (up to 2 levels) residential building. Footings cast on or native stiff to very stiff clayey silt can be designed using a Geotechnical Reaction at SLS of 150 kPa. The SLS value given above is based on a maximum settlement of 25 mm under the footing foundations. The Factored Geotechnical Resistance at ULS is 250 kPa.

These soil bearing pressures can be achieved provided that the founding subgrade is undisturbed during construction. The majority of the settlements will take place during construction and the first loading cycle of the building.

Engineered fill may be used to replace the firm/loose native soils. Procedures for engineered fill placement are given in Section 6.3.

The following table summarizes the highest founding level and elevation for the footing at each borehole location:

Borehole No.	Existing Ground Elevation (m)	Highest Founding Depth (m)	Highest Founding Elevation (m)
1	349.01	1.01	348.00
2	349.52	1.02	348.50
3	350.71	2.41	348.30
4	350.90	1.60	349.30
5	351.19	1.16	350.00
6	355.89	1.09	354.80
7	354.07	4.57	349.50
8	350.59	0.89	349.70
9	352.47	1.87	350.60
10	350.61	1.01	449.60
11	349.19	1.49	347.70

It is recommended that a lean concrete mat be placed over approved footing subgrade in wet or saturated areas to prevent further disturbance to the bearing soils resulting from construction activities.

In addition, the footings should be founded below any existing fill materials, on native undisturbed soils. Spacing between adjacent footing steps should not be steeper than 10H to 7V.

The maximum total and differential settlements of footings designed to the above-recommended soil bearing pressure are expected to be less than 25 and 12 mm, respectively, and these are considered tolerable for the structure being contemplated.

Exterior footings and footings in unheated portions of the building should be provided with a soil cover of not less than 1.2 m or equivalent synthetic thermal insulation for adequate frost protection. The founding subgrade soils must be protected from frost penetration during winter construction.

It is recommended that the footing excavations be inspected by the geotechnical engineer to ensure adequate soil bearing and proper subgrade preparation.

6.3 Site Grading and Engineered Fill

It is anticipated that site grading procedure will be required across the site. It is recommended to construct engineered fill in areas to be raised in order to suitably support the future building foundations, floor slabs and pavement areas. Additional boreholes/test pits will be required to establish the vertical and horizontal extent of the loose fill materials, especially near Borehole 7 where 3.66 m deep fill materials were identified.

Prior to any new fill placement, the site needs to be appropriately prepared. For footings constructed on engineered fill, the existing topsoil, fill materials, organics and all loose/firm native soils need to be stripped/excavated to expose competent native subgrade soil.

The inorganic onsite clayey silt deposits are deemed suitable for site regrading operations. The moisture content of these excavated soils should be within 3% below the optimum moisture content in order to achieve the specified degrees of compaction. The excavated inorganic fine granular soils can be reused to construct the engineered fill provided that this fill material is not overly wet or dry.

The grading work should be carried out during relatively dry weather as the predominant clayey silt soils are sensitive to wetting and are difficult to handle when wet. Therefore, earthworks should be scheduled in the drier summer months. The native fine granular soils are susceptible to softening and deformation when exposed to excessive moisture and construction traffic. As a result, it is imperative that the grading/filling operations are planned and maintained to direct surface water run-off to low points and then be positively drained by suitable means. During periods of wet weather, construction traffic should be directed along the designated construction routes so as not to disturb and rut the exposed subgrade soil. Temporary construction roads consisting of clear crushed material (such as crushed stone or recycled concrete) may be required during poor weather conditions such as a wet Spring or Fall.

Should additional bulk fill require to be imported to the site for site grading purposes, it should be similar in gradation to the existing on-site granular soils or consist of OPSS Granular B Type I. It is recommended that any proposed borrow source materials be tested prior to importing, in order to ensure that the environmental quality of the fill meets all environmental approval standards and to ensure that the natural moisture content of the fill is suitable for compaction.

Backfilling local excavations (such as foundation walls, footings and trenches inside the building footprint) should be performed using imported OPSS Granular B Type I or approved on-site soil. Some of the onsite fill materials could be reused to construct the engineered fill, provided that they are free of organics and deleterious materials.

It is recommended that any off-site borrow source materials be tested prior to importing, in order to ensure that the environmental quality of the fill meets all environmental approval criteria and to ensure that the natural moisture content of the fill is suitable for compaction.

The engineered fill should be constructed in accordance with the following procedures in order to support building foundations, floor slabs and pavement areas:

1) All topsoil, fill materials, firm clayey silt soils and deleterious materials are to be stripped from building and pavement areas to expose competent native subgrade soils.

2) The exposed subgrade surface is to be thoroughly recompacted by large heavy compaction equipment (10 tonne compactor is recommended) and inspected by qualified geotechnical personnel. Any loose or soft areas identified should be excavated to the level of competent soil;

3) The required grades can then be achieved by placing approved onsite soils or imported sand and gravel (OPSS Granular "B" Type I), in maximum 300 mm thick lifts and compacted to at least 100% Standard Proctor maximum dry density (SPMDD) in areas to support building foundations and floor slabs. The specified degree of compaction may be reduced to a minimum of 95% SPMDD in roadway areas.

4) The moisture content of the fill materials is recommended to be within 3% below their optimum moisture contents in order to achieve the specified degrees of compaction;

5) Engineered fill must be placed such that the fill pad extends horizontally outwards from all footings at least the same distance as how thick the engineered fill pad will exist between the underside of future footings and the approved native earth subgrade;

6) Compaction above the footing foundations to the floor subgrade level (for support of the floor slab) is to be no less than 95% SPMDD;

7) All fill placement and compaction operations must be supervised on a full-time basis by qualified geotechnical personnel to approve fill material and ensure the specified degrees of compaction have been achieved.

During construction, vibration could be generated from various construction equipment, such as compactors and rollers which could be harmful to surrounding structures and buildings. Peak particle velocity (PPV) of ground motion is widely accepted as the best descriptor of potential for vibration damage to structures. The safe vibration limit can be set to 10 to 20 mm/s PPV, depending on the sensitive of surrounding structures to vibration.

Vibration monitoring can be carried out to measure the PPV of ground motion from vibration generated from typical compaction equipment at the beginning of the project in the potentially critical areas. This will set criteria and establish the type of equipment to be used for this project.

It is recommended that a pre-construction condition survey be conducted to document the condition of the existing structures within the possible zone of influence.

6.4 Earthquake Considerations

In accordance with The Ontario Building Code 2012 (OBC), the proposed structure should be designed to resist earthquake load and effects as per OBC Subsection 4.1.8.

Based on the anticipated condition of the underlying soil condition encountered at the boreholes, the site can be classified as a Site Class C as per OBC Table 4.1.8.4.A (Page B4-24).

6.5 Open Cut Excavation and Groundwater Control

Excavations are expected to be in the order of 2 to 4 m deep for engineered fill placement, foundation and site servicing. The excavations will penetrate loose to compact and soft to stiff fill materials and firm to very stiff clayey silt. These materials are considered to be Type 3 Soils in accordance with the latest Occupational Health and Safety Act.

Above the groundwater table, excavations in the Type 3 Soils are expected to remain stable during the construction period provided that side slopes are cut to 1H : 1V from the bottom of the excavation. Where seepage or perched groundwater is encountered, side slopes should be cut to more stable angles of 3H : 1V. The side slopes should be suitably protected from erosion processes.

Rainwater or local perched groundwater can be controlled by pumping from filtered sump pits as and where required. It is recommended that excavation for future development be done during the typically drier summer months when groundwater conditions would be expected to lie at lower elevations.

In wet to saturated subgrade condition, it will be necessary to excavate below founding level and pour a 75 mm thick mud slab of lean concrete to protect the founding soil from disturbance during the installation of reinforcing steel bars and formwork.

6.6 Floor Slab Construction

Based on the proposed finished floor elevations of the residential units, the finished first floor levels will lie above the observed high groundwater table. Assuming a depth of 3.2± m for proposed walkout/lookout basements, basement finished floor elevations will lie 0.7± to 2.0± m below the seasonal high groundwater table in the areas of lots 3 to 19 and 29 to 48. However, due to the very low permeability of the native clayey silt soils, basements can still be constructed below the groundwater table with a conventional weeping tile and sump pump drainage system implemented at each townhome block.

It may be necessary to install an underfloor drainage system in these townhome blocks to efficiently convey the water to the sumps. It is recommended that at least one (1) sump pit should be installed in every 3 units. Positive grade adjacent to the basement will direct surface water away from the building, preventing surface water infiltration.

Cognizant of the expected subgrade soil conditions at the finished basement floor levels, it is anticipated that a system of underfloor drains (at 6 m spacing) will be required and be connected to a positively drained sump(s) or permanently to the municipal sewer to locally control the groundwater table (and expected fluctuations) in order to keep the basement floors in a dry condition.

The exposed subgrade should be proof-rolled with a heavy roller in conjunction with an inspection by the geotechnical engineer at the time of floor slab construction. Excess moisture in the subgrade soil will render the material incompactable. Any soft and/or unstable areas detected should be replaced with imported Granular "B" Type I which should be compacted to 95% SPMDD.

Following the proof-rolling of the subgrade, it is recommended that a minimum 150 mm thick layer of OPSS Granular "A" be placed and compacted to at least 100% SPMDD beneath the concrete floor slabs to provide uniform support.

A modulus of subgrade reaction (k_s) of 30 MN/m^3 may be used for the design of the floor slabs, considering the floor subgrade will consist of predominantly clayey silt soils.

The floor slab should be separated structurally from the columns and foundation walls. Sawcut control joints should be provided at regular spacing (less than 30 times the concrete slab thickness) and to depths between one-third to one-quarter of the slab thickness.

Moisture migration from the underlying soils through the concrete slab-on-grade will take place via "capillary action" and "diffusion" (due to vapour pressure differential). Although the Granular "A" layer will provide a capillary break, the low permeance of the concrete slab and floor coverings will result in 100% humidity under the concrete slab and, consequently, the moisture in the concrete will increase over time. The potential effect of the soil moisture should be considered in selecting the floor coverings. A vapour retarder material (such as a 15 mil poly, ASTM E-1745) can be placed to reduce soil moisture migration. Reference is made to ACI 302.

6.7 Lateral Earth Pressure

The unbalanced foundation walls and any other soil retaining structures should be designed to resist the lateral earth pressure acting against these walls. The following formula may be used to calculate the unfactored earth pressure distribution. The factored resistance can be calculated by using a factor of 0.8.

$P = K(\gamma H + q)$

where:

P =	lateral earth pressure	kPa
K =	earth pressure coefficient, 0.5 for non-yielding foundation wall earth pressure coefficient, 0.3 for yielding retaining wall	
γ =	unit weight of granular backfill, compacted to 95% SPMDD	21 kN/m^3
H =	unbalanced height of wall	m
q =	surcharge load at ground surface	kPa

The backfill for the foundation walls and retaining walls should be free-draining granular materials which should have less than 8% silt particles (OPSS Granular "B" Type I). The backfill should be placed in thin layers and compacted to 95% SPMDD. Over-compaction should be avoided. Weeping tiles leading to a frost-free outlet or weep holes should be installed to effect drainage behind the retaining wall.
The sliding resistance of the retaining wall footings should be checked. The unfactored horizontal resistance against sliding between cast-in-place concrete and the various soils can be calculated using a friction coefficient as follows:

- Firm to very stiff clayey silt: 0.40
- Granular engineered fill: 0.35

The unit weight of clayey silt is 19 kN/m^3 and a unit weight of the granular backfill compacted to 95% SPMDD is 21 kN/m^3.

6.8 Access Driveway and Paved Parking Areas

Based on the results of the field work, the predominant subgrade materials at the site will consist of native clayey silt or engineered fill.

The following flexible pavement structures are recommended based on the results of grain size distribution, assumed CBR values, groundwater table, frost susceptibility of subgrade soils and traffic volume.

Component	Light Duty Pavement (mm)	Heavy Duty Pavement (mm)
Asphaltic Concrete HL3 HL8	 40 40	 40 50
Granular "A" Base	150	150
Granular "B" Sub-base	300	400

Due to the frost susceptibility of the subgrade soils, the pavement design considers that pavement construction will be carried out during the drier time of the year and that the subgrade is stable, not heaving under construction equipment traffic. If the subgrade is wet or unstable, additional granular sub-base may be required.

The base and sub-base materials should be produced in accordance with the current OPSS specifications and placed and uniformly compacted to at least 100% SPMDD. The asphaltic concrete should be placed and compacted in accordance with OPSS Form 310 and to at least 92% of the Marshall Density (MRD). Frequent in situ density testing by this office should be carried out to verify that the specified degree of compaction is being achieved and maintained.

It should be noted that even well-compacted trench backfill could settle for a period of time after construction. In this regard, the surface course of the asphaltic concrete should be placed at least one (1) year after trench backfill is completed so as to allow any minor settlements to occur within the trench backfill. The incomplete pavement structure may not be capable of supporting construction traffic. Consequently, minor repairs of the sub-base, base and asphaltic concrete may be required prior to paving with the base course and/or the surface course asphaltic concrete.

The prepared earth subgrade and final pavement surfaces should be graded to direct water runoff away from buildings, sidewalks and other similar pertinent structures. Positive drainage outlets should be provided at all low points of the prepared earth subgrade, such as stub drains extended from the catch-basins.

6.9 Concrete Pavement

The existing clayey silt material is frost-susceptible and will be subject to frost heaving. All concrete sidewalks adjacent to the building entrances (where the insulating effect of snow cover is removed on a continuous basis) should be underlain by a minimum 1.2 m thick suitably compacted OPSS Granular "B" Type I in order to ensure that the underlying frost-susceptible silt soil does not cause differential heaving problems in the winter months. Alternatively, equivalent suitable thermal insulation can be provided beneath these areas.

If OPSS Granular "B" Type I materials are used to backfill the foundation wall at the entrances, frost heaving of the concrete sidewalks or pavers will not be a concern.

6.10 Slope Stability Assessment

The site is irregular in shape and runs lengthwise along Firella Creek. The site is terraced and an approximate 1 to 2 m high curving bank dissects the site along its length.

The upper slope (bank) has a slope inclination of approximately 5H:1V. The ground surface of the upper terrace slopes downwards in a southeasterly direction. The highest ground on the upper terrace is located in the northwestern portion of the site with a ground surface elevation at approximately 356.0± m and slopes down to approximately 348.5± m, the lowest elevation on the upper terrace. The lower terrace which is about 10 to 35 m wide is relatively flat-lying.

A second 1 to 2 m high steep bank runs along the bottom of the lower terrace and the bank of Firella Creek. The lower bank (slope) has a slope inclination of approximately 1.5H:1V. The elevation of the bottom of the lower bank is between 345.8 and 346.3 m.

Based on Grand River Conservation Authority (GRCA) Regulation No. 124-15, effective October 23, 2015, the site can be defined as an "Apparent Valley (Confined System – Steep But Stable) as the slope adjacent to the upper terrace is less than 3H:1V.

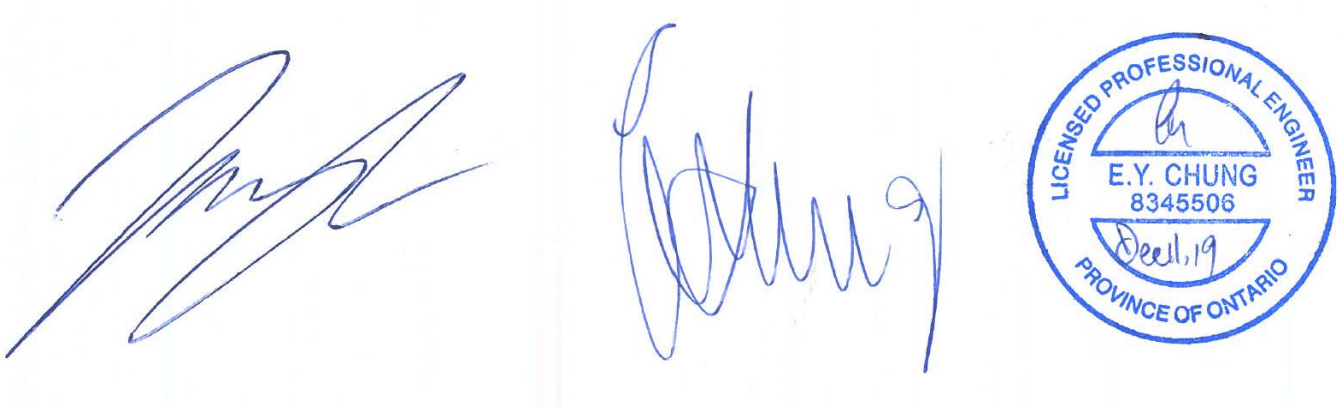
No stable slope allowance is required above the crest of the upper slope. The lower slope is located between 10 and 35 m from the toe of the upper slope which is an adequate distance for the toe erosion allowance. An erosion access allowance of 6 m is considered adequate as the site is readily accessible from both the top and the bottom of the upper slope.

7.0 CLOSURE

The Limitations of Report, as quoted in Appendix A, is an integral part of this report.

We trust that the information presented in this report is complete within our terms of reference. If there are any further questions concerning this report, please do not hesitate to contact our office.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.



Joseph van der Zalm, E.I.T.
Geotechnical Engineering Intern

Eric Y. Chung, M. Eng., P.Eng.
Principal Engineer

APPENDIX A

LIMITATIONS OF REPORT

APPENDIX "A"

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes and their respective depths may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

The benchmark and elevations mentioned in this report were obtained strictly for use in the geotechnical design of the project and by this office only, and should not be used by any other parties for any other purposes.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. CHUNG & VANDER DOELEN ENGINEERING LIMITED accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

This report does not reflect the environmental issues or concerns unless otherwise stated in the report.

APPENDIX B

Previous Borehole Logs by Chung & Vander Doelen Engineering Ltd.

FILE No: E19807

BOREHOLE No. 7

Enclosure No.:
Sheet 1 of 1

Client: **Jim Flynn**

Project: **Phase II Environmental Site Assessment**

Location: **1016, 1018 & 1030 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D-50T**
Method: **Hollow Stem Auger**
Size: **108 mm I.D.**
Date: **Aug 28 - 19** TO **Aug 28 - 19**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	SHEAR STRENGTH (kPa) / PENETRATION RESISTANCE	WATER CONTENT (%)	WELL DATA	DEPTH (m)	REMARKS
	Ground Elevation: **352.08 m**					FIELD VANE: Peak ⊗ Rem. ×; LAB TEST: Unc. ■ P.P. □; 50 100 150 200; STANDARD ● DYN. CONE ○; 20 40 60 80	W_P W W_L; 10 20 30			
351.78	brown, mosit TOPSOIL with organics	0.0	1	SS	9				0.0	flushmount casing set in concrete
0.30		0.5							0.5	0.0 ppm
	brown FILL, silty sand moist to wet									bentonite seal/50 mm I.D. PVC riser
351.01		1.0	2	SS	5				1.0	
1.07	brown to grey CLAYEY SILT some gravel and cobbles moist to saturated	1.5	3	SS	14				1.5	water level in monitoring well at a depth of 1.26 m on September 4, 2019
		2.0							2.0	
		2.5							2.5	
		3.0	4	SS	17				3.0	3.0 m long, 50 mm I.D. PVC screen with sandpack
		3.5							3.5	0.0 ppm
		4.0							4.0	
347.51		4.5							4.5	
4.57	End of Borehole									monitoring well installed in BH7 at 4.57 m
		5.0							5.0	
		5.5							5.5	
		6.0							6.0	
		6.5							6.5	
		7.0							7.0	
		7.5							7.5	
		8.0							8.0	
		8.5							8.5	

PROJECT MANAGER: **JK**

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APPENDIX C

Well Response Test Analysis Charts

CHUNG & VANDER DOELEN
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519-742-8979

Slug Test - Water Level Data

Project: 1016, 1018, 1024, 1030 & 1032 Doering Street

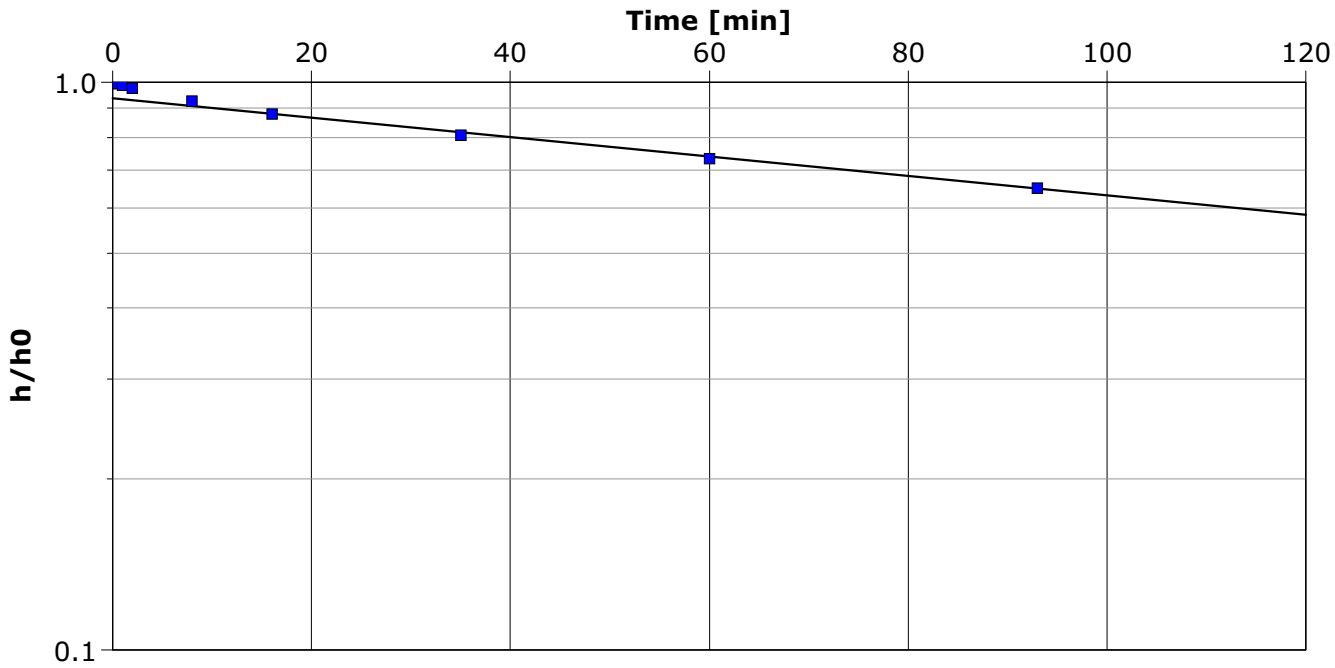
Number: G18713

Client: Mr. Jim Flynn

Location: Wellesley, ON	Slug Test: ESA - BH 7	Test Well: ESA - BH 7
Test Conducted by: D. White	Test Date: 15/11/2019	
Water level at t=0 [m]: 3.84	Static Water Level [m]: 0.70 T.O.P	Water level change at t=0 [m]: 3.14

	Time [min]	Water Level [m]	WL Change [m]
1	0	3.84	3.14
2	0.5	3.82	3.12
3	1	3.80	3.10
4	2	3.76	3.06
5	8	3.61	2.91
6	16	3.46	2.76
7	35	3.23	2.53
8	60	3.00	2.30
9	93	2.74	2.04

Aquifer Thickness: 3.87 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 7	2.07×10^{-8}	

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Slug Test - Water Level Data

Project: 1016, 1018, 1024, 1030 & 1032 Doering Street

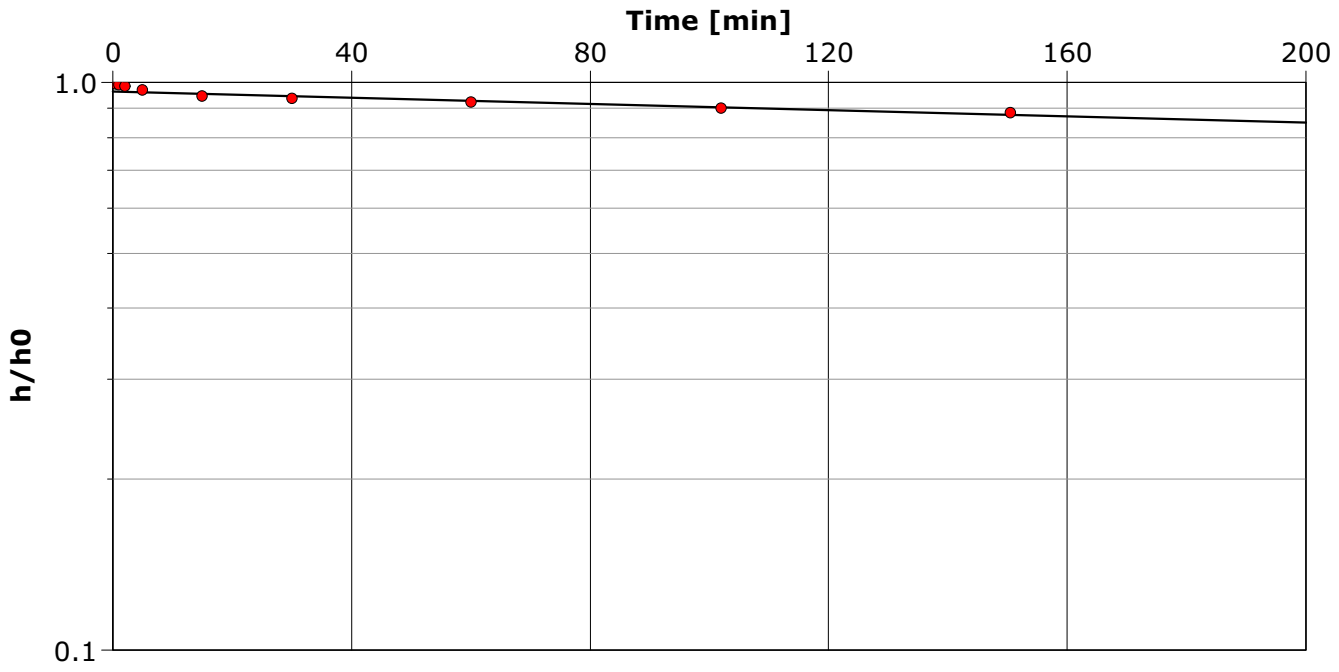
Number: G18713

Client: Mr. Jim Flynn

Location: Wellesley, ON	Slug Test: BH 5	Test Well: BH 5
Test Conducted by: D. White	Test Date: 15/11/2019	
Water level at t=0 [m]: 5.77	Static Water Level [m]: 3.97 T.O.P	Water level change at t=0 [m]: 1.80

	Time [min]	Water Level [m]	WL Change [m]
1	0	5.77	1.80
2	0.5	5.76	1.79
3	1	5.755	1.785
4	2	5.74	1.77
5	5	5.715	1.745
6	15	5.675	1.705
7	30	5.66	1.69
8	60	5.63	1.66
9	102	5.59	1.62
10	150.5	5.56	1.59

Aquifer Thickness: 2.82 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH 5	3.31×10^{-9}	

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Slug Test - Water Level Data

Project: 1016, 1018, 1024, 1030 & 1032 Doering Street

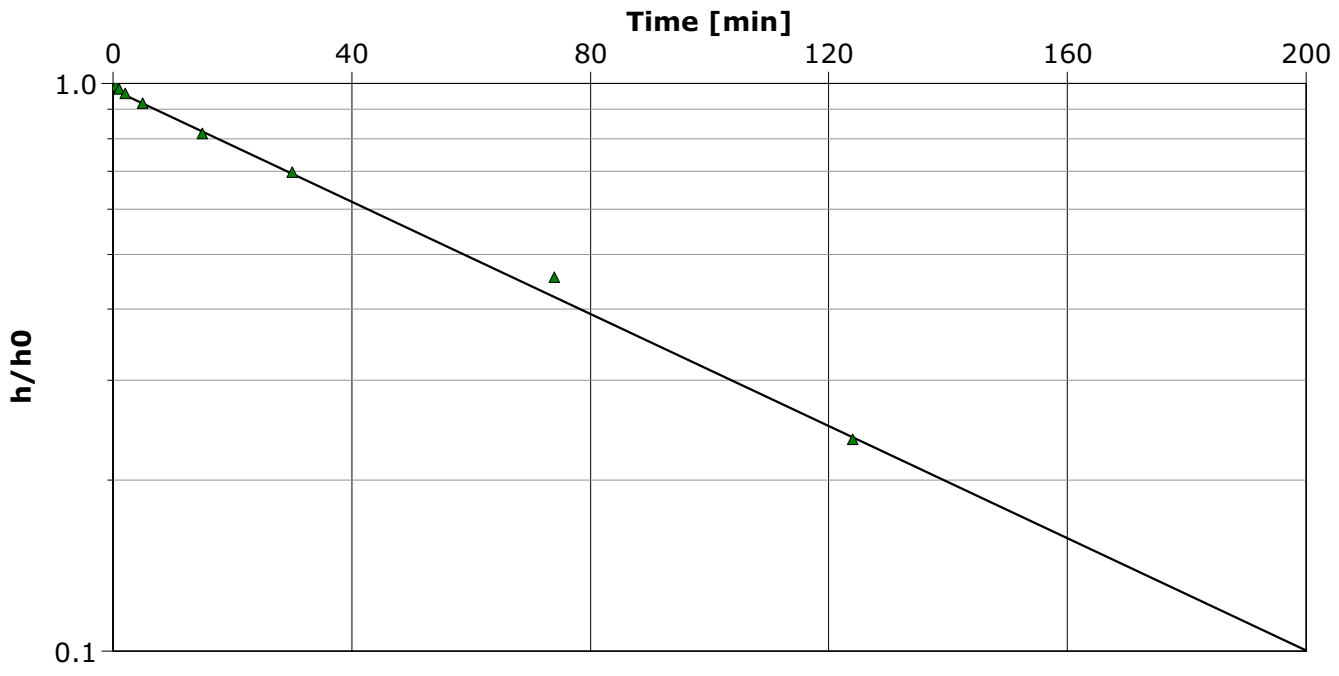
Number: G18713

Client: Mr. Jim Flynn

Location: Wellesley, ON	Slug Test: BH 2	Test Well: BH 2
Test Conducted by: D. White	Test Date: 15/11/2019	
Water level at t=0 [m]: 6.18	Static Water Level [m]: 1.18 T.O.P	Water level change at t=0 [m]: 5.00

	Time [min]	Water Level [m]	WL Change [m]
1	0	6.18	5.00
2	0.5	6.13	4.95
3	1	6.07	4.89
4	2	5.99	4.81
5	5	5.79	4.61
6	15	5.26	4.08
7	30	4.67	3.49
8	74	3.46	2.28
9	124	2.36	1.18

Aquifer Thickness: 5.69 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH 2	5.50×10^{-8}	

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Slug Test - Water Level Data

Project: 1016, 1018, 1024, 1030 & 1032 Doering Street

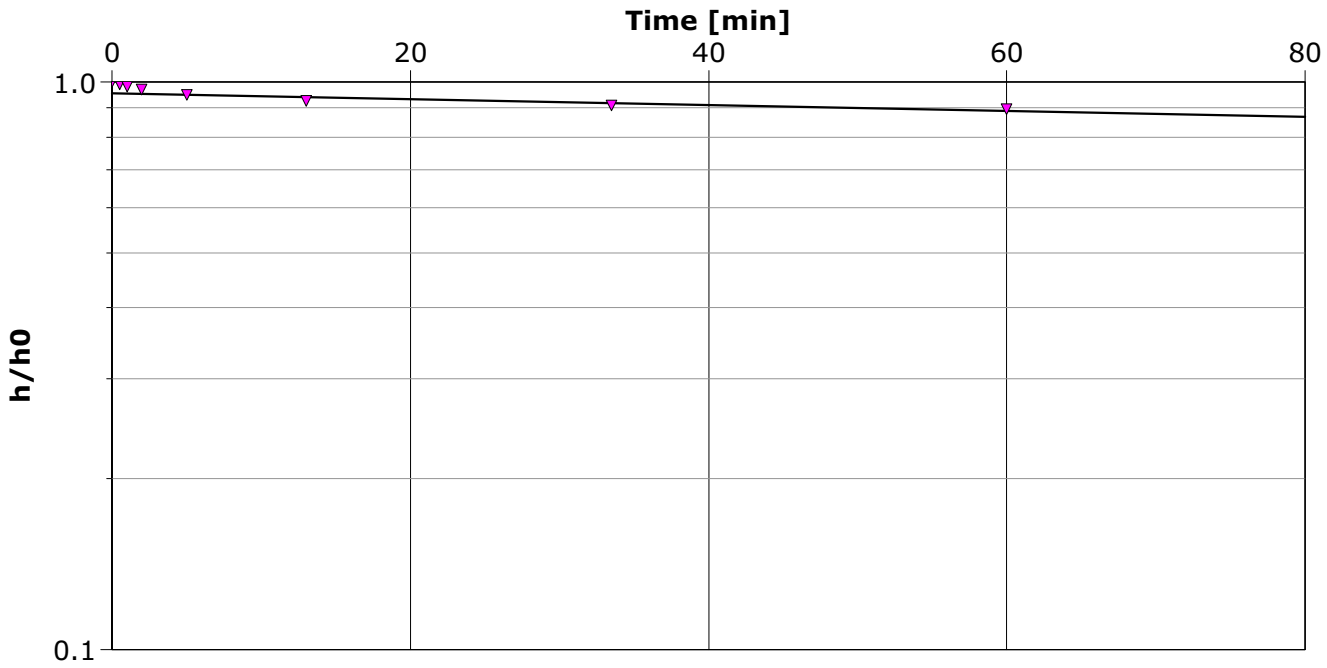
Number: G18713

Client: Mr. Jim Flynn

Location: Wellesley, ON	Slug Test: BH 6	Test Well: BH 6
Test Conducted by: D. White	Test Date: 15/11/2019	
Water level at t=0 [m]: 6.43	Static Water Level [m]: 1.98 T.O.P	Water level change at t=0 [m]: 4.45

	Time [min]	Water Level [m]	WL Change [m]
1	0	6.43	4.45
2	0.5	6.39	4.41
3	1	6.35	4.37
4	2	6.30	4.32
5	5	6.21	4.23
6	13	6.10	4.12
7	33.5	6.02	4.04
8	60	5.97	3.99

Aquifer Thickness: 4.97 m



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH 6	6.12×10^{-9}	

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Slug Test - Water Level Data

Project: 1016, 1018, 1024, 1030 & 1032 Doering Street

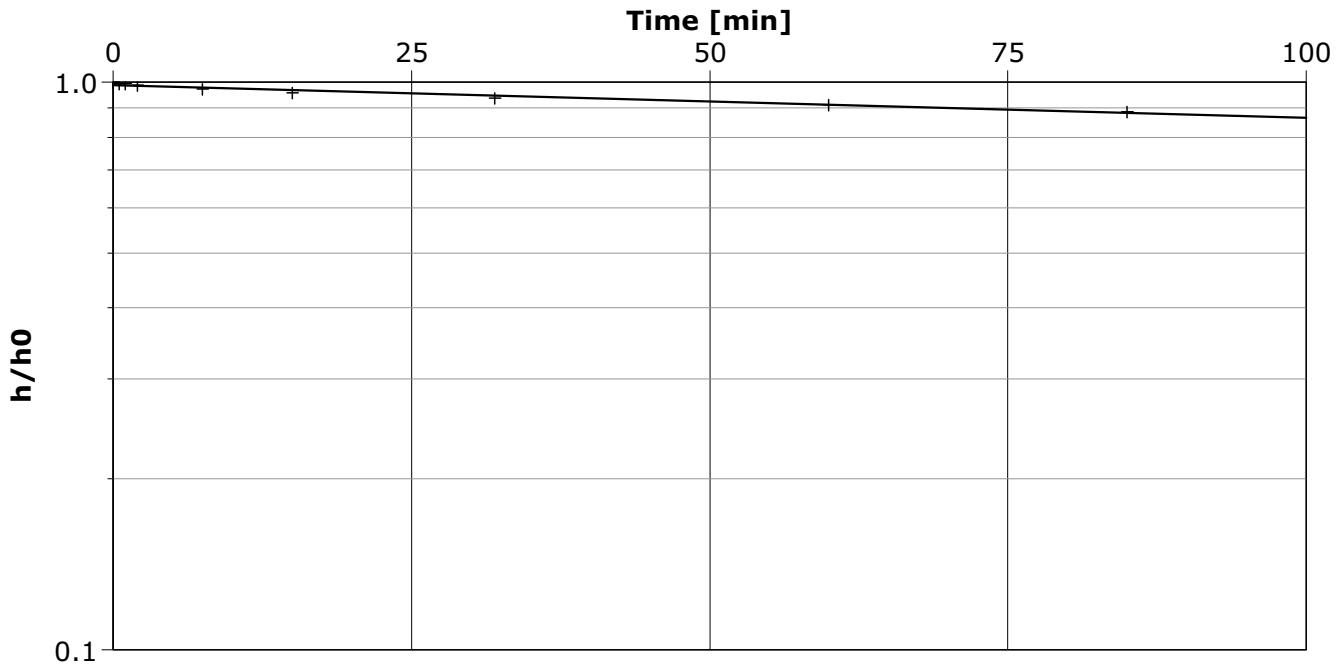
Number: G18713

Client: Mr. Jim Flynn

Location: Wellesley, ON	Slug Test: BH 10	Test Well: BH 10
Test Conducted by: D. White	Test Date: 15/11/2019	
Water level at t=0 [m]: 6.87	Static Water Level [m]: 1.50 T.O.P	Water level change at t=0 [m]: 5.37

	Time [min]	Water Level [m]	WL Change [m]
1	0	6.87	5.37
2	0.5	6.84	5.34
3	1	6.83	5.33
4	2	6.805	5.305
5	7.5	6.73	5.23
6	15	6.65	5.15
7	32	6.53	5.03
8	60	6.39	4.89
9	85	6.27	4.77

Aquifer Thickness: 6.76 m

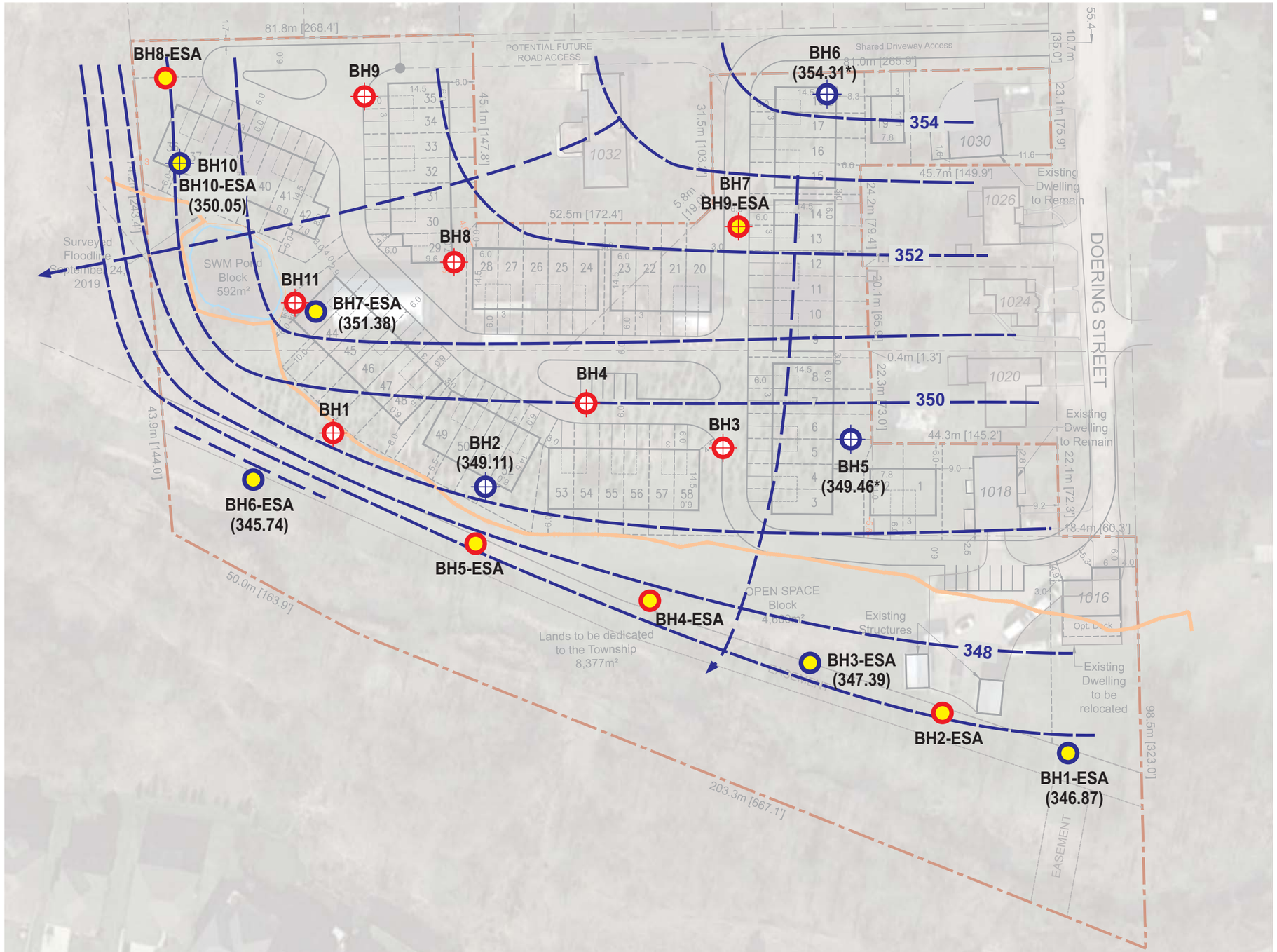


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH 10	6.95×10^{-9}	

APPENDIX D

Groundwater Contour Drawing by Chung & Vander Doelen Engineering Ltd.



LEGEND

BH8-ESA — Monitoring Well / Borehole (for Phase 2 ESA)

BH8 — Monitoring Well / Borehole (for Geotech Investigation)

(352.71) — Water Table Elevation (mASL)
- November 15, 2019
- * December 4, 2019

352 — Interpreted Water Table Contour (mASL)

Interpreted Shallow Groundwater Flow Direction

0 10 20 m

Scale 1:800

Figure 3
Development Plan &
Water Table Interpretation
(November-December 2019)

Source Water Protection
Potential Contamination Study
Doering St. Development, Wellesley, ON

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 2E1 / 519-742-8979

Drawn By: SA	Date: Dec 4 2019	File No.: H19108

ENCLOSURES

FILE No: G18713

BOREHOLE No. 1

Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Jan 23 - 19** TO **Jan 23 - 19**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	WELL DATA	DEPTH (m)	REMARKS
	Ground Elevation: **349.01 m**								
	380 mm TOPSOIL								
348.63				1	SS	8			
0.38	stiff to very stiff brown to grey CLAYEY SILT trace to some sand, trace gravel occ. silt seams moist	0.5						0.5	
		1.0		2	SS	11		1.0	
		1.5						1.5	
		2.0		3	SS	17		2.0	
		2.5						2.5	
		3.0		4	SS	19	▽	3.0	water level at 2.9 m bgs upon completion of drilling
		3.5						3.5	
345.05				5	SS	29			
3.96	compact brown SAND some gravel, trace silt saturated	4.0						4.0	
		4.5						4.5	
343.98				6	SS	25			
5.03	End of Borehole	5.0						5.0	borehole cave-in at 4.9 m bgs upon completion of drilling
		5.5						5.5	
		6.0						6.0	
		6.5						6.5	
		7.0						7.0	
		7.5						7.5	
		8.0						8.0	

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

PROJECT MANAGER: **EYC**

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Enclosure No.: 2
Sheet 1 of 1

FILE No: G18713

BOREHOLE No. 2

Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Jan 23 - 19** TO **Jan 23 - 19**

Ground Elevation: **349.52 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE
349.22	300 mm TOPSOIL				
0.30	loose, brown FILL, sandy silt, trace gravel wet	0.5	1	SS	8
348.76					
0.76	stiff to very stiff brown to grey CLAYEY SILT trace to some sand, trace gravel occ. silt seams moist	1.0	2	SS	14
		1.5	3	SS	17
		2.0			
		2.5	4	SS	14
		3.0	5	SS	12
		3.5			
345.56		4.0			
3.96	dense grey SILT trace sand, trace clay occ. clay seams saturated	4.5	6	SS	41
		5.0			
344.03		5.5			
5.49	very dense grey SAND AND SILT TILL trace to some gravel, trace clay moist	6.0	7	SS	73
342.97		6.5			
6.55	End of Borehole				
		7.0			
		7.5			
		8.0			

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)	REMARKS
0.5	steel casing set in concrete
2.0	bentonite seal/50 mm I.D. PVC riser
4.5	3.0 m long, 50 mm I.D. PVC screen with sandpack
6.5	water level in monitoring well at depth of 0.32 m bgs on January 30, 2019
7.0	water level in monitoring well at depth of 0.36 m bgs on March 8, 2019
7.5	water level in monitoring well at depth of 0.74 m bgs on September 4, 2019
8.0	water level in monitoring well at depth of 0.41 m bgs on November 15, 2019

PROJECT MANAGER: **EYC**

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FILE No: G18713

BOREHOLE No. 3

Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Jan 23 - 19** TO **Jan 23 - 19**

SOIL LITHOLOGY

Ground Elevation: **350.71 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)
350.52	190 mm TOPSOIL	
0.19	very loose to loose dark brown FILL, clayey silt some sand, trace gravel, some organics moist to wet ----- 0.5 m buried topsoil	0.5 1.0 1.5 2.0
348.42 2.29	firm to very stiff brown to grey CLAYEY SILT trace to some sand, trace gravel occ. silt seams moist	2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0
344.16 6.55	End of Borehole	6.5 7.0 7.5 8.0

SYMBOL

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	8
2	SS	4
3	SS	3
4	SS	10
5	SS	10
6	SS	21
7	SS	6
8	SS	15
9	SS	24

SHEAR STRENGTH (kPa)

FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200

PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)

W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

- water level at 2.7 m bgs upon completion of drilling
- borehole open upon completion of drilling

PROJECT MANAGER: **EYC**

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Enclosure No.: 4
Sheet 1 of 1

FILE No: G18713

BOREHOLE No. 4

Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Jan 23 - 19** TO **Jan 23 - 19**

SOIL LITHOLOGY

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL
	Ground Elevation: **350.90 m**		
	300 mm TOPSOIL		
350.60			
0.30	very loose to compact dark brown to brown FILL, sandy silt trace clay moist	0.5 1.0	
349.38		1.5	
1.52	very stiff, brown CLAYEY SILT trace sand wet	2.0	
348.77			
2.13	compact grey SILT trace to some sand, trace clay saturated	2.5	
348.00			
2.90	stiff grey CLAYEY SILT trace to some sand, trace gravel occ. silt seams moist to wet	3.0 3.5 4.0 4.5 5.0 5.5 6.0	
344.35		6.5	
6.55	End of Borehole		
		7.0 7.5 8.0	

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	3
2	SS	15
3	SS	15
4	SS	15
5	SS	15
6	SS	13
7	SS	14

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

- water level at 2.7 m bgs upon completion of drilling
- borehole cave-in at 5.3 m bgs upon completion of drilling

PROJECT MANAGER: **EYC**

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FILE No: G18713

BOREHOLE No. 5

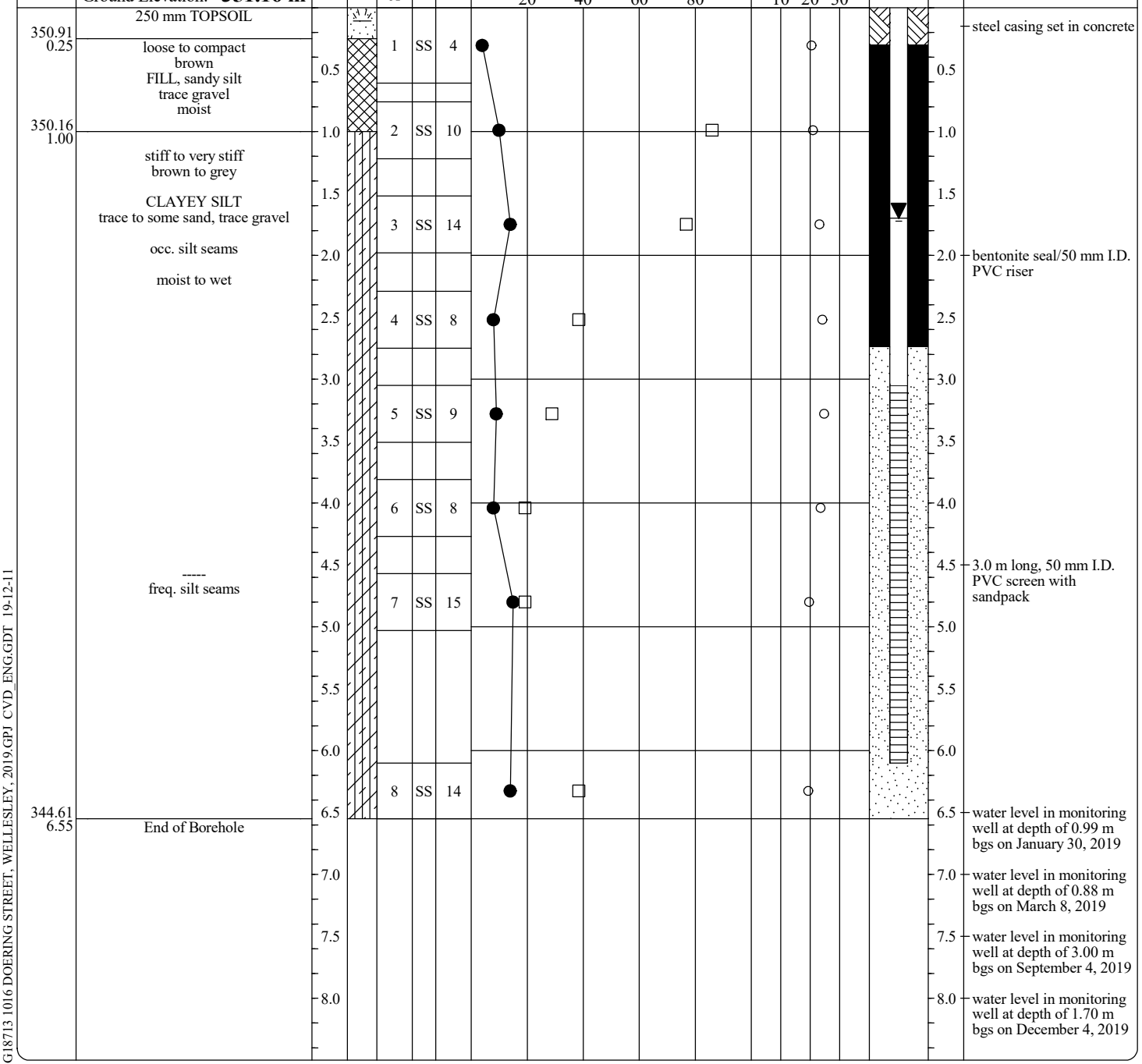
Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Jan 23 - 19** TO **Jan 23 - 19**



PROJECT MANAGER: **EYC**

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FILE No: G18713

BOREHOLE No. 6

Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **108 mm I.D.**
Date: **Aug 27 - 19** TO **Aug 27 - 19**

Ground Elevation: **355.89 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	REMARKS
355.79 / 0.10	100 mm TOPSOIL					steel casing set in concrete
355.53 / 0.36	compact, brown FILL, silty sand some gravel trace to some topsoil/organics moist	0.5	1	SS	11	
	stiff brown to grey CLAYEY SILT trace to some sand, trace gravel occ. silt seams moist	1.0	2	SS	11	
		1.5	3	SS	12	
		2.0				bentonite seal/50 mm I.D. PVC riser
		2.5	4	SS	13	
		3.0	5	SS	14	
		3.5				
		4.0				
		4.5	6	SS	12	3.0 m long, 50 mm I.D. PVC screen with sandpack
		5.0				
		5.5				
		6.0				
		6.5	7	SS	9	
349.34 / 6.55	End of Borehole					
		7.0				
		7.5				water level in monitoring well at depth of 5.15 m bgs on September 4, 2019
		8.0				water level in monitoring well at depth of 1.58 m bgs on December 4, 2019

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

PROJECT MANAGER: **EYC**

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FILE No: G18713

BOREHOLE No. 7

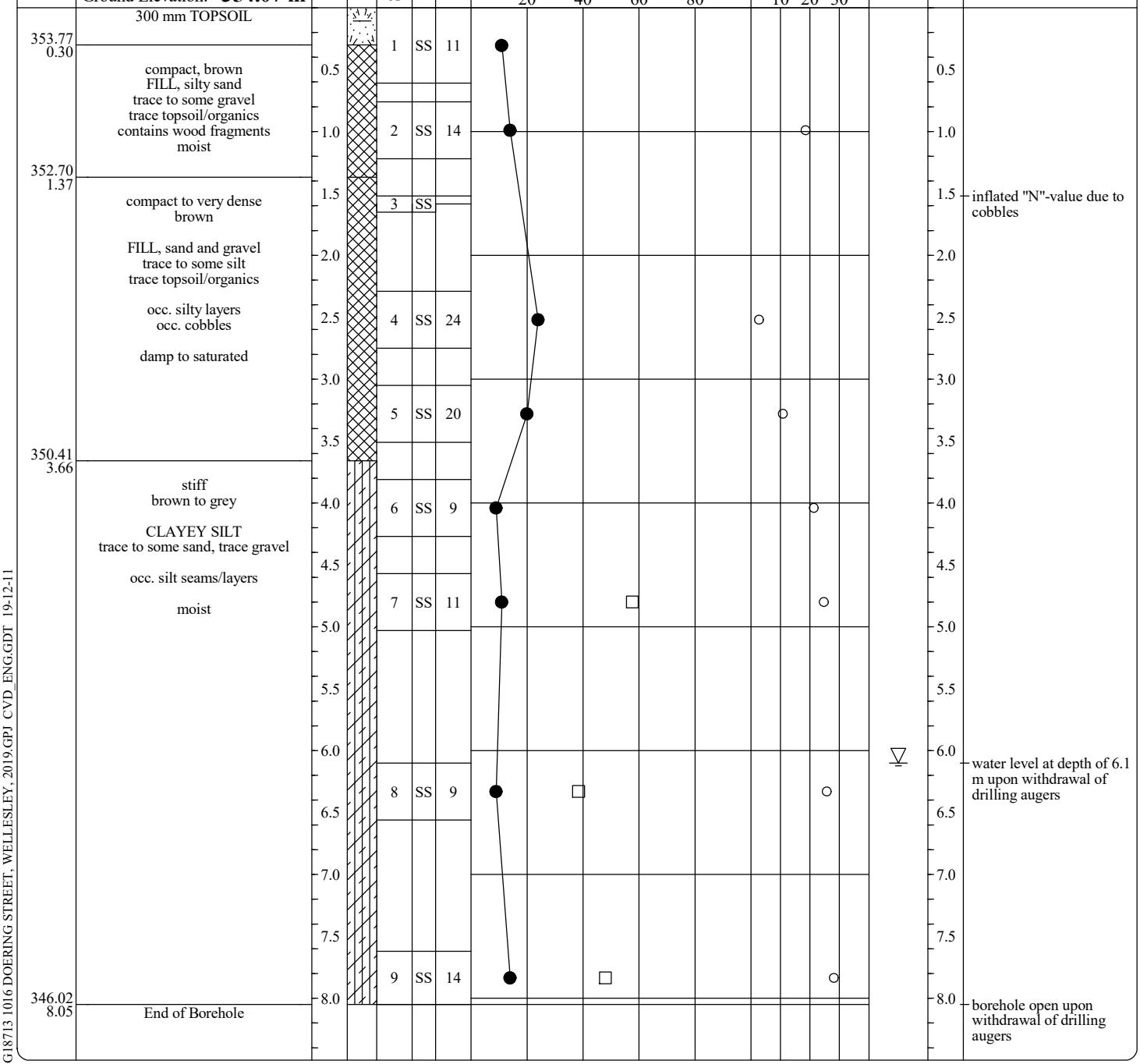
Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **108 mm I.D.**
Date: **Aug 27 - 19** TO **Aug 27 - 19**



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FILE No: G18713

BOREHOLE No. 8

Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Aug 26 - 19** TO **Aug 26 - 19**

Ground Elevation: **350.59 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE
350.34	250 mm TOPSOIL				
0.25	compact, dark brown FILL, sandy silt trace gravel, trace clay trace to some topsoil/organics occ. clayey seams moist	0.5	1	SS	10
349.90		1.0	2	SS	17
0.69	stiff to very stiff brown to grey CLAYEY SILT trace to some sand, trace gravel occ. silt seams/layers moist	1.5	3	SS	16
		2.0			
		2.5	4	SS	15
		3.0			
		3.5	5	SS	19
		4.0			
		4.5			
		5.0	6	SS	13
		5.5			
		6.0			
		6.5	7	SS	16
344.04					
6.55	End of Borehole				

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

borehole dry and open upon withdrawal of drilling augers

PROJECT MANAGER: **EYC**

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FILE No: G18713

BOREHOLE No. 9

Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Aug 26 - 19** TO **Aug 26 - 19**

SOIL LITHOLOGY

Ground Elevation: **352.47 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE
352.09	380 mm TOPSOIL	0.0	1	SS	10
0.38	firm to stiff brown FILL, clayey silt some sand trace topsoil/organics moist	0.5			
		1.0	2	SS	7
351.10		1.5			
1.37	stiff to very stiff brown to grey CLAYEY SILT trace to some sand, trace gravel occ. silt seams moist	2.0	3	SS	8
		2.5	4	SS	19
		3.0	5	SS	18
		3.5			
		4.0			
		4.5	6	SS	14
		5.0			
		5.5			
		6.0			
345.92		6.5	7	SS	11
6.55	End of Borehole				

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

borehole dry and open upon withdrawal of drilling augers

PROJECT MANAGER: **EYC**

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FILE No: G18713

BOREHOLE No. 10

Enclosure No.: 10
Sheet 1 of 1

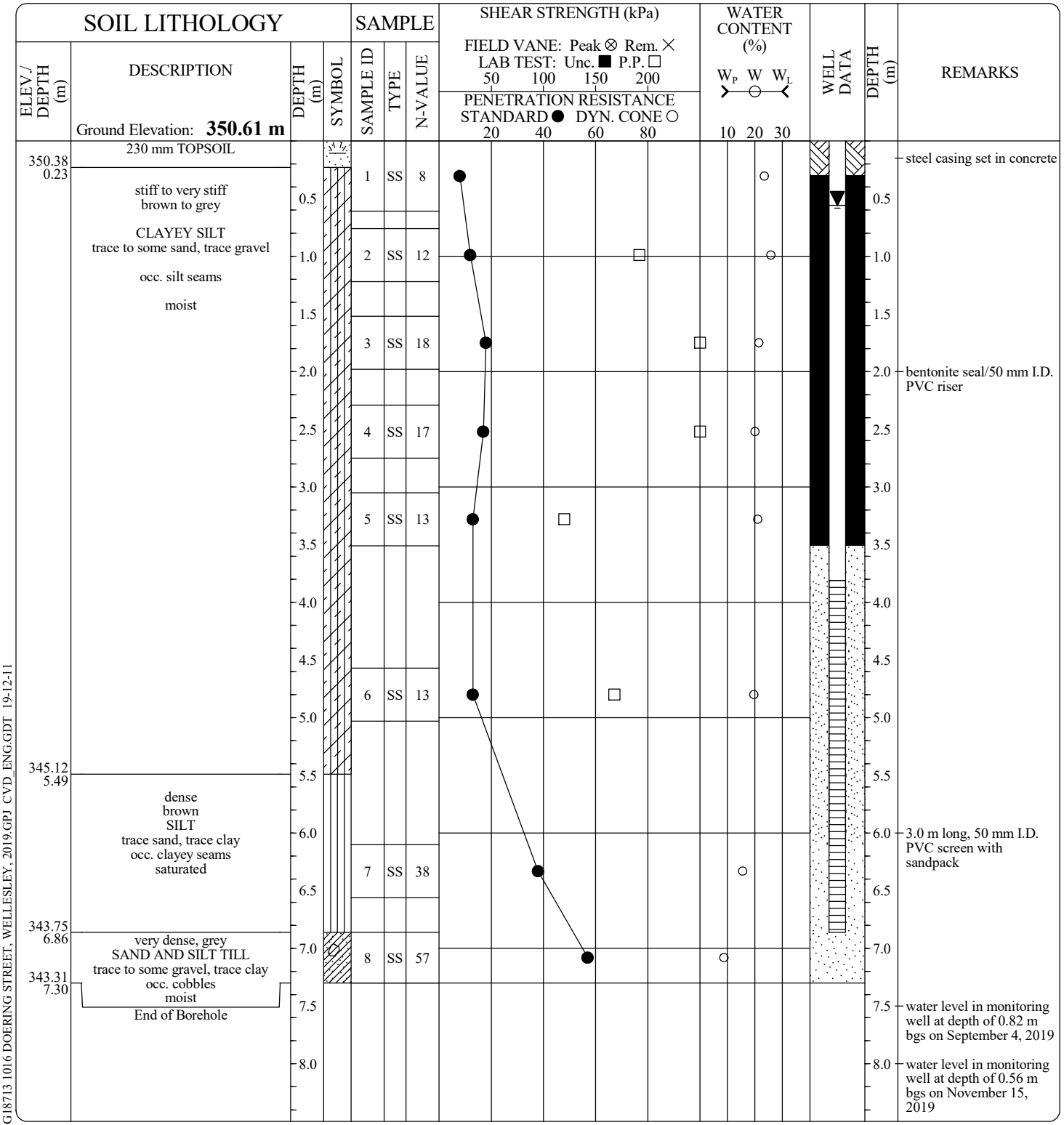
Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **108 mm I.D.**
Date: **Aug 26 - 19** TO **Aug 26 - 19**



PROJECT MANAGER: **EYC**

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FILE No: G18713

BOREHOLE No. 11

Client: **Mr. Jim Flynn**

Project: **Proposed Residential Development**

Location: **1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Aug 26 - 19** TO **Aug 26 - 19**

SOIL LITHOLOGY

Ground Elevation: **349.19 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)
349.01	180 mm TOPSOIL	
0.18	loose, dark brown FILL, sandy silt trace to some gravel trace topsoil/organics contains asphalt fragments moist	0.5
348.50		
0.69	compact, brown FILL, sand trace to some gravel, trace silt saturated	1.0
347.82		
1.37	very stiff brown to grey CLAYEY SILT trace to some sand, trace gravel occ. silt seams/layers moist	1.5
		2.0
		2.5
		3.0
		3.5
		4.0
		4.5
343.70		5.0
5.49	very dense grey SAND AND SILT TILL some gravel, trace clay moist	5.5
		6.0
342.81		
6.38	End of Borehole	6.5
		7.0
		7.5
		8.0

SYMBOL

SAMPLE ID	TYPE	N-VALUE
1	SS	9
2	SS	26
3	SS	18
4	SS	16
5	SS	19
6	SS	23
7	SS	50/125 mm

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

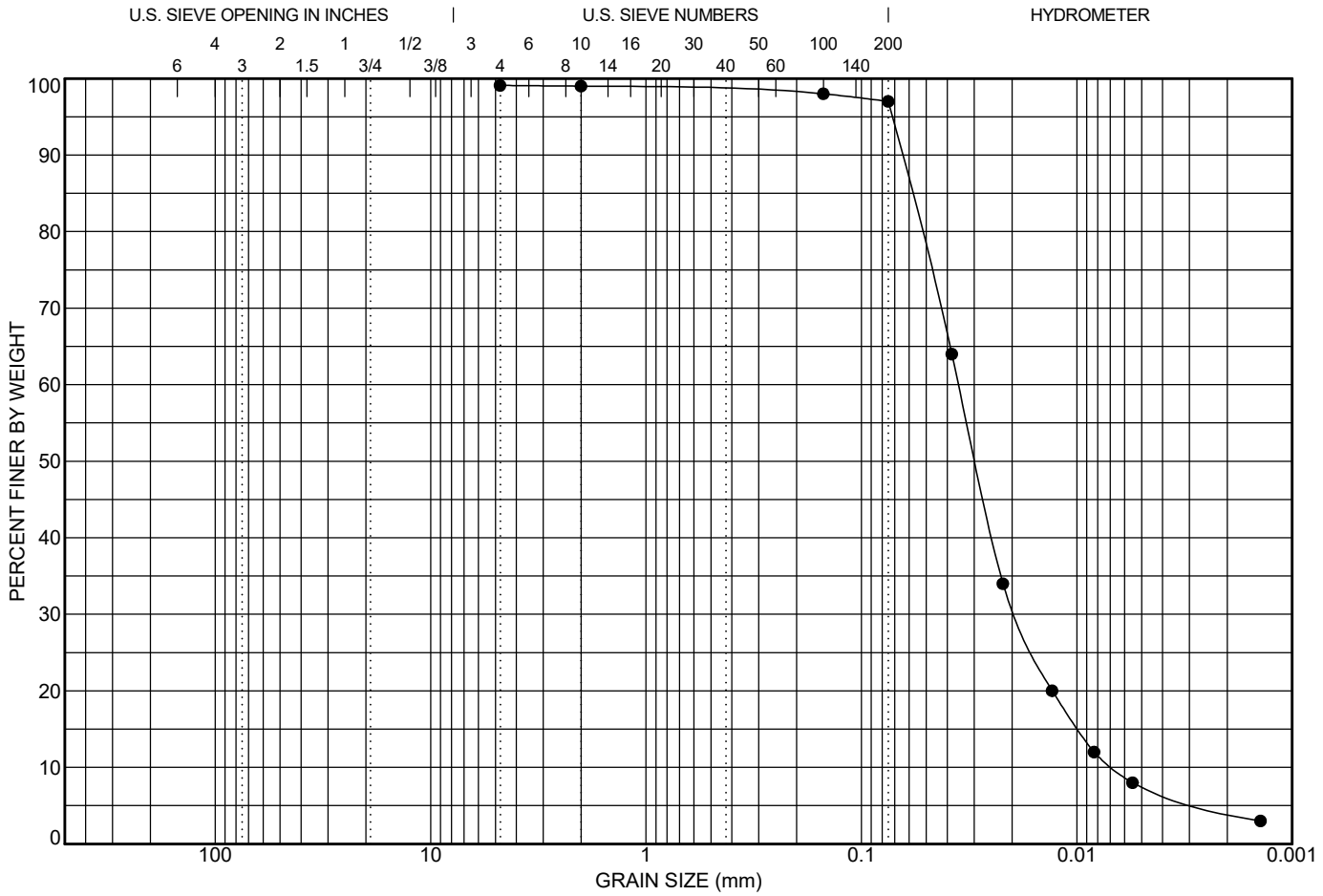
DEPTH (m)

REMARKS

- water level at depth of 3.0 m upon withdrawal of drilling augers
- borehole cave-in at depth of 5.64 m upon withdrawal of drilling augers

PROJECT MANAGER: **EYC**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.50	5.23	4.75	0.035	0.019	0.007	0.0	2.1	97.0	

Date: Mar. 12 - 2019
Client: Mr. Jim Flynn
Contractor:
Source:
Sampled From: BH 2, SA 6, 4.57-5.03 m depth
Sample No.: 2-6
Date Sampled: Jan. 23 - 2019
Sampled By: NZ
Lab No.: 54
Date Tested: Jan. 30 - 2019
Type of Material: Silt, trace sand, trace clay

Sieve Size (mm)	Percent Passing	No Specifications

CHUNG & VANDER DOELEN
ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

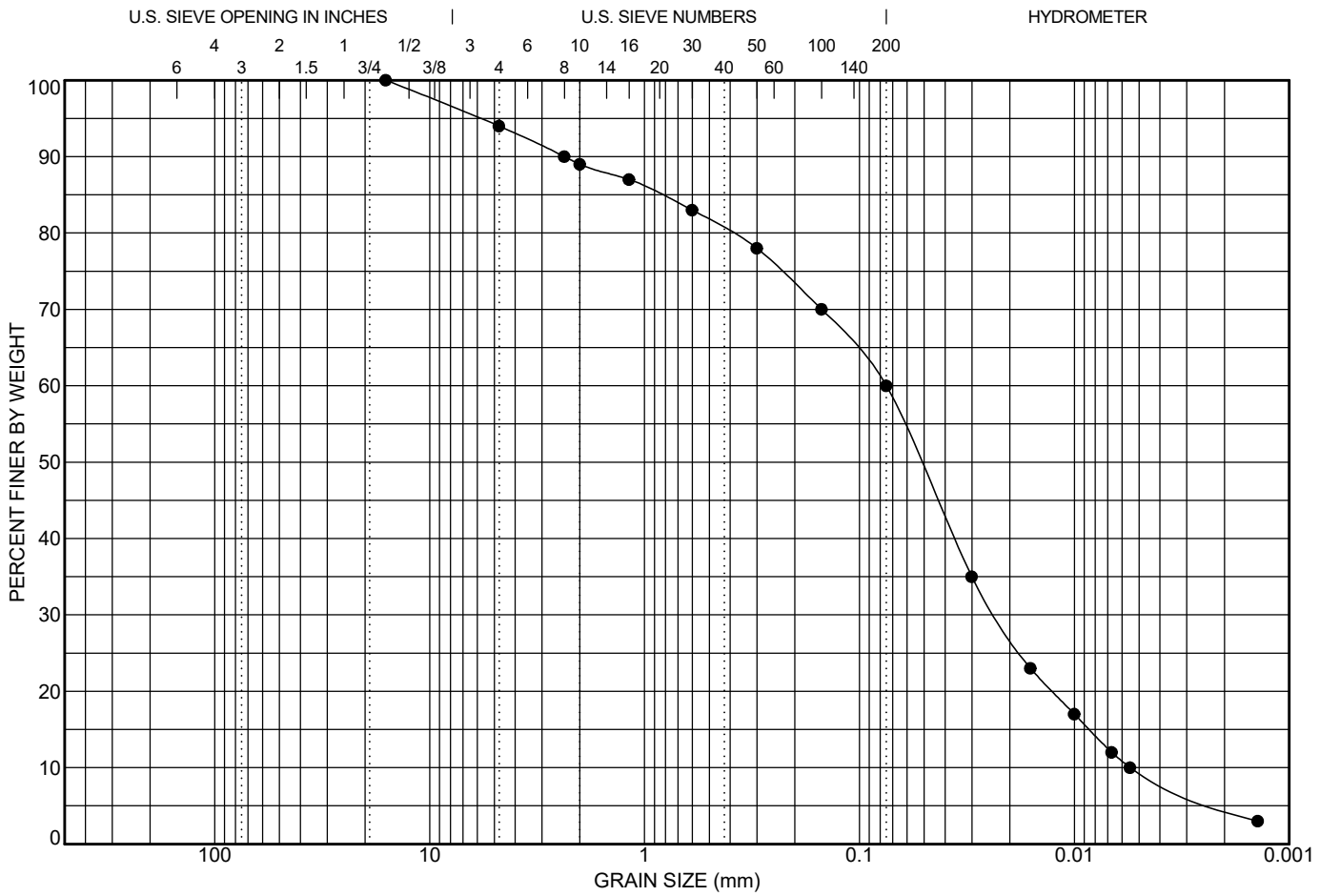
GRAIN SIZE DISTRIBUTION

Project: Proposed Residential Development

Location: 1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario

File No.: G18713

Enclosure No.: 12



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.29	13.64	16	0.075	0.023	0.006	6.0	34.0	60.0	

Date: Mar. 12 - 2019
Client: Mr. Jim Flynn
Contractor:
Source:
Sampled From: BH 2, SA 7, 6.10-6.55 m depth
Sample No.: 2-7
Date Sampled: Jan. 23 - 2019
Sampled By: NZ
Lab No.: 55
Date Tested: Jan. 30 - 2019
Type of Material: Sand and Silt Till, trace gravel, trace clay

Sieve Size (mm)	Percent Passing	No Specifications

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Fax: 519-742-7739
e-mail: info@cvdengineering.com

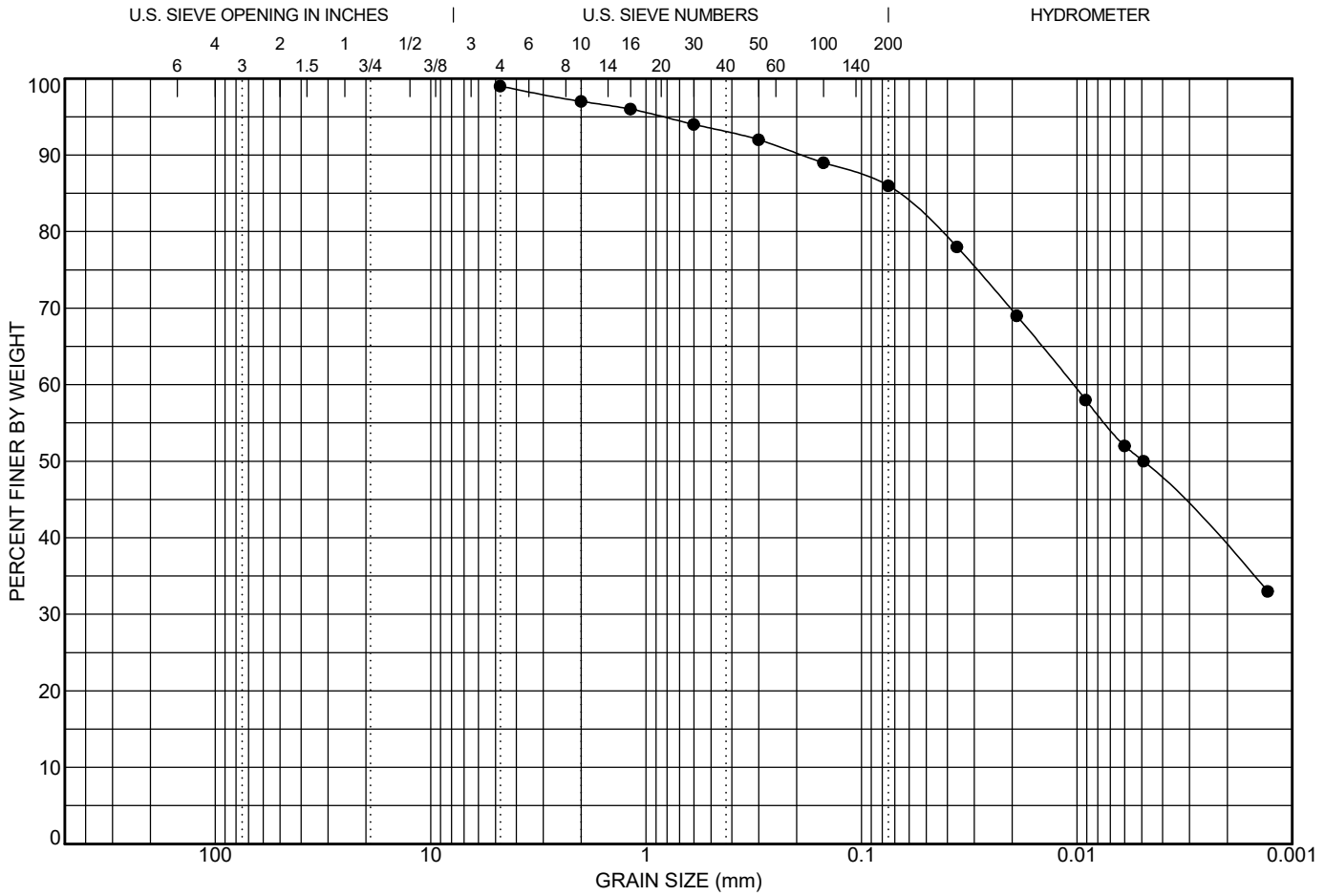
GRAIN SIZE DISTRIBUTION

Project: Proposed Residential Development

Location: 1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario

File No.: G18713

Enclosure No.: 13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					4.75	0.01			0.0	13.0	86.0	

Date: Mar. 12 - 2019
Client: Mr. Jim Flynn
Contractor:
Source:
Sampled From: BH 3, SA 8, 5.33-5.79 m depth
Sample No.: 3-8
Date Sampled: Jan. 23 - 2019
Sampled By: NZ
Lab No.: 56
Date Tested: Jan. 30 - 2019
Type of Material: Clayey Silt, some sand, trace gravel

Sieve Size (mm)	Percent Passing	No Specifications

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Fax: 519-742-7739
e-mail: info@cvdengineering.com

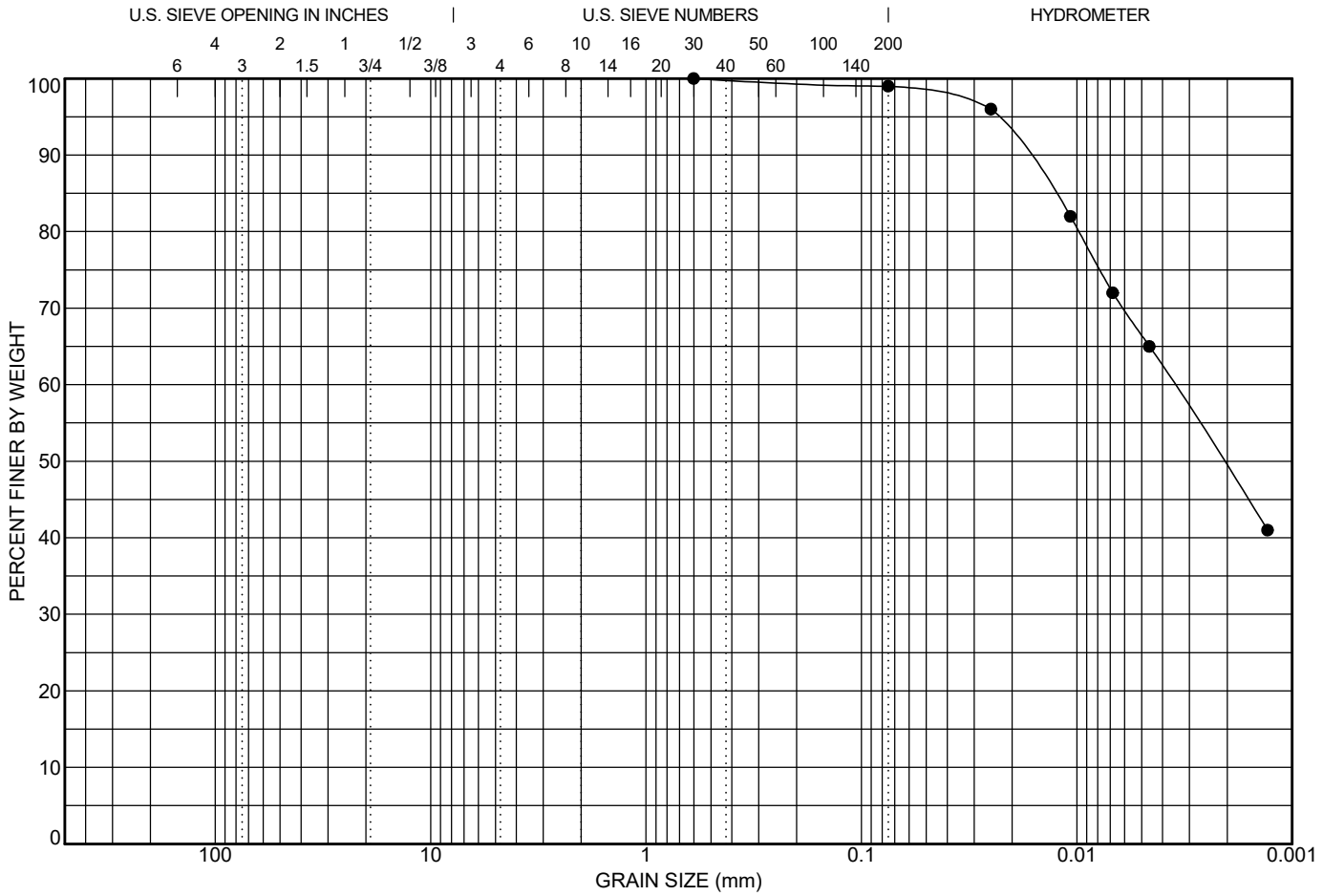
GRAIN SIZE DISTRIBUTION

Project: Proposed Residential Development

Location: 1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario

File No.: G18713

Enclosure No.: 14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					0.6	0.004			0.0	1.0	99.0	

Date: Mar. 12 - 2019
Client: Mr. Jim Flynn
Contractor:
Source:
Sampled From: BH 5, SA 6, 3.81-4.27 m depth
Sample No.: 5-6
Date Sampled: Jan. 23 - 2019
Sampled By: NZ
Lab No.: 57
Date Tested: Jan. 30 - 2019
Type of Material: Clayey Silt, trace sand

Sieve Size (mm)	Percent Passing	No Specifications

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Fax: 519-742-7739
e-mail: info@cvdengineering.com

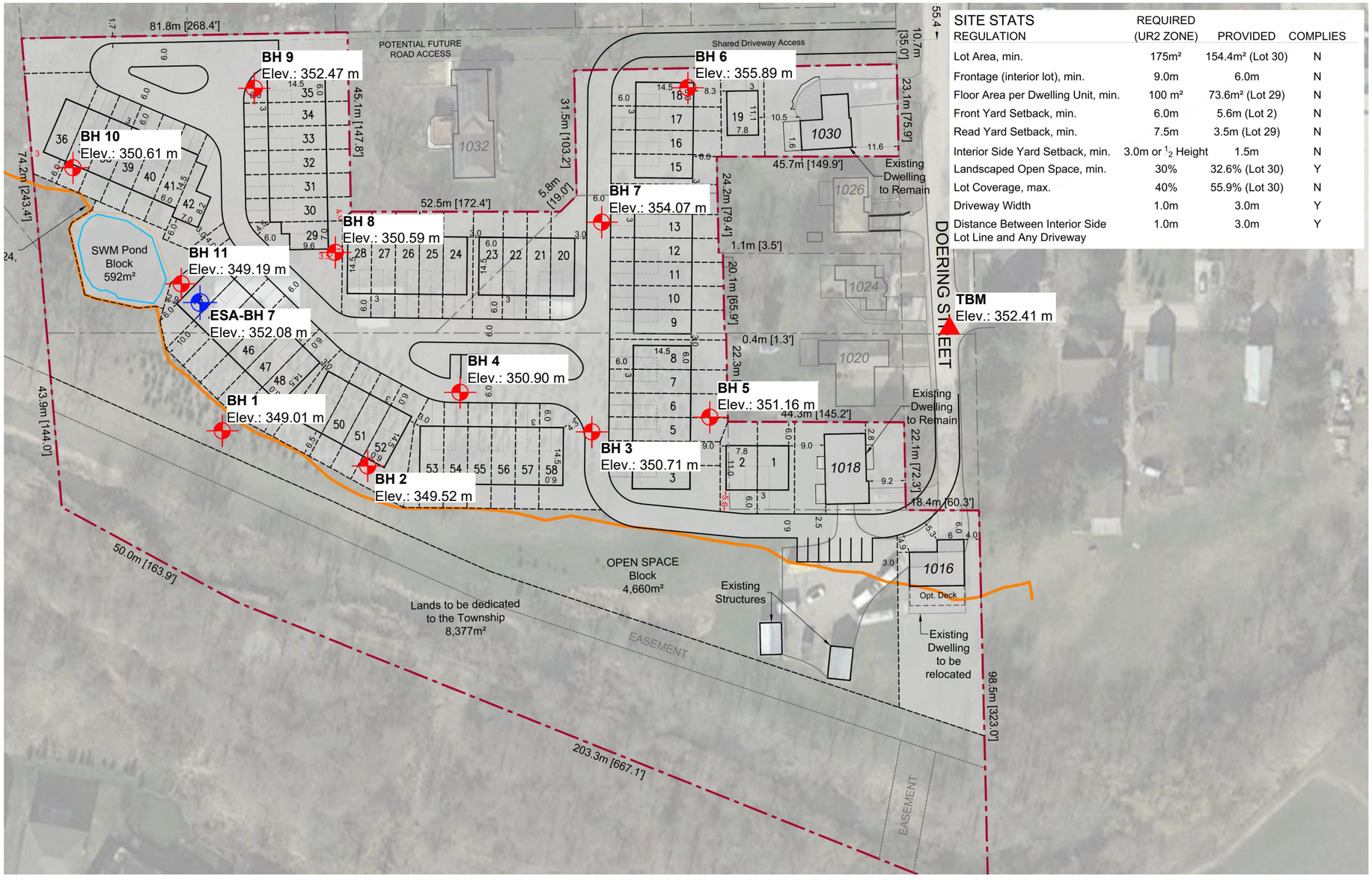
GRAIN SIZE DISTRIBUTION

Project: Proposed Residential Development

Location: 1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley, Ontario

File No.: G18713

Enclosure No.: 15



SITE STATS REGULATION	REQUIRED (UR2 ZONE)	PROVIDED	COMPLIES
Lot Area, min.	175m²	154.4m² (Lot 30)	N
Frontage (interior lot), min.	9.0m	6.0m	N
Floor Area per Dwelling Unit, min.	100 m²	73.6m² (Lot 29)	N
Front Yard Setback, min.	6.0m	5.6m (Lot 2)	N
Read Yard Setback, min.	7.5m	3.5m (Lot 29)	N
Interior Side Yard Setback, min.	3.0m or $\frac{1}{2}$ Height	1.5m	N
Landscaped Open Space, min.	30%	32.6% (Lot 30)	Y
Lot Coverage, max.	40%	55.9% (Lot 30)	N
Driveway Width	1.0m	3.0m	Y
Distance Between Interior Side Lot Line and Any Driveway	1.0m	3.0m	Y

KEY PLAN **SOURCE:** Google Earth

LEGEND

TBM: Top of manhole in Doering Street in front of Residential No. 1024 Elev.: 352.41 m (Geodetic)

Borehole Location

Borehole Location - Phase II ESA

Dwg. Ref.: *GSP; "Development Concept"; 1016, 1018, 1024, 1030 & 1032 Doering Street, Wellesley; Proj. No.: 18275; September 25, 2019*

Elev. Ref.: *Van Harten Surveying Inc.; "Topographic Survey of Part of Lot61 Municipal Compiled Plan 1148"; Geographic Township of Wellesley*

BOREHOLE LOCATION PLAN

Proposed Residential Development

1016, 1018, 1024, 1030 & 1032
Doering Street
Wellesley, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1 / 519-742-8979

Drawn By: NZ/JV	Date: October, 2019	File No.: G18713
Checked By: EYC	Scale: N.T.S	Drawing No.: 1

APPENDIX B

Pre-Development Catchment Drainage Area Plan
Post-Development Catchment Drainage Area Plan

LEGEND

- PROPERTY LINE
- EX. SANITARY SEWER
- EX. STORM SEWER
- EX. WATERMAIN
- EX. DITCH
- EX. BELL LINE
- EX. GAS LINE
- EX. FENCE LINE
- EX. GAS MAIN
- EX. OVERHEAD HYDRO
- EX. BELL UNDERGROUND
- EX. CONTOURS
- EX. CATCH BASIN
- EX. FIRE HYDRANT
- EX. LIGHT STANDARD
- EX. HEDGE/ROW OF TREES
- CONIFEROUS/DECIDUOUS TREES
- EX. 5YEAR FLOODLINE
- REGIONAL FLOODLINE
- EX. TOP OF BANK
- EX. BOTTOM OF BANK
- PROPERTY LINE
- EX. GRAVEL
- EX. ASPHALT
- PROPOSED GRADE / EXISTING GRADE
- PROP. SANITARY SEWER
- PROP. STORM SEWER
- PROP. CATCH BASIN
- PROP. SWALE
- MAJOR OVERLAND FLOW ROUTE
- PROP. RETAINING WALL
- LIMIT OF DEVELOPMENT
- DRAINAGE AREA BOUNDARY
- CATCHMENT NUMBER
- IMPERVIOUS %
- CATCHMENT AREA IN HECTARES

NAFZIGER ROAD

DOERING STREET

MOLESWORTH ST

CONSTRUCTION

BM1-NAIL IN ASPHALT ELEVATION=355.26

BM2-NAIL IN ASPHALT ELEVATION=352.35

EX. CANVAS COVERED DRIVE SHED TO BE REMOVED

EX. SHED TO BE REMOVED

EX. POND (WATER ELEV=344.50)

EX. FIRELLA CREEK

EX. SANITARY EASEMENT

GRAND RIVER CONSERVATION AUTHORITY REGULATORY FLOODLINE 349.1m

GRAND RIVER CONSERVATION AUTHORITY 5-YEAR STORM FLOODLINE 347.5m

APPROXIMATE LOCAION OF EXISTING SANITARY MANHOLE TO BE CONFIRMED AS PART OF DETAILED DESIGN

APPROXIMATE LOCATION OF SANITARY SERVICE FOR NO. 18 TO BE CONFIRMED AS PART OF DETAILED DESIGN

EX. SANITARY SERVICE TO BE ABANDONED

OUTLET FOR EXISTING CATCHBASIN TO BE CONFIRMED AS PART OF THE DETAILED DESIGN

EXISTING HOUSE No. 1016

1 STORY BRICK/SIDING HOUSE (No. 1030)

1 STORY BRICK/SIDING HOUSE (No. 1026)

1 STORY SIDING HOUSE (No. 1024)

1 STORY BRICK HOUSE (No. 1020)

1 STORY BRICK HOUSE (No. 1018)

STORY BRICK HOUSE (No. 1032)

EX. CONCRETE PATIO

EX. ASPHALT DRIVEWAY

EX. CONCRETE AND ASPHALT DRIVEWAY

EX. PAVING STONE WALKWAY

EX. RETAINING WALL

EX. INTERLOCKING STONE RETAINING WALL TO BE REMOVED

EX. ASPHALT TO BE REMOVED

EX. GRAVEL DRIVEWAY TO BE REMOVED

EX. FENCE TO BE REMOVED

EX. ROW OF TREES TO BE REMOVED

TOP OF WELL=354.19

FFE=356.95

GFE=356.85

FFE=353.95

GFE=354.89

FFE=353.56

GFE=352.38

GFE=352.05

FFE=352.08

FFE= 352.30

E=347.17

MH 74 U/G=347.59 NE=344.77 SW=339.47

MH 75 U/G=347.60 NE=344.04 SW=344.02

MH 76 U/G=347.89 NE=344.37 S/W=344.32 NW=346.12

MH 77

EX. MH 1A NE=344.46 SW=344.42 E=344.49 W=345.06

EX. 86.7m - 375Ø SAN @ 1.47%

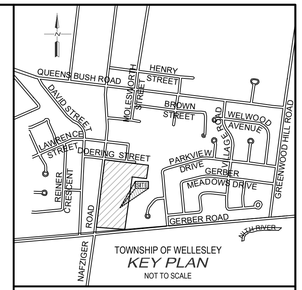
EX. 78.6m - 375Ø SAN @ 0.36%

EX. 31.0m - 150Ø SAN @ 6.69%

EX. 97.7m - 300Ø SAN @ 1.00%

EX. 32.5m - 375Ø SAN @ 0.10%

EX. 83.3m - 200Ø SAN @ 8.40%



TOWNSHIP OF WELLESLEY

KEY PLAN

NOT TO SCALE

NOTES :

1. TOPOGRAPHIC SURVEY PROVIDED BY VAN HARTEN SURVEYING INC. DRAWING "FlynnTopo_2020-04-28.dwg" RECEIVED APRIL 28, 2020.
2. FLOODLINE ELEVATION SUPPLIED BY GRCA. MEASURED ON SITE DATED DECEMBER 13, 2018. ELEV=349.10
3. LOT FABRIC DERIVED FROM CONCEPT PLAN OBTAINED FROM VAN HARTEN SURVEYING INC. DATED JUNE. 28, 2019 JOB NUMBER 27097-19
4. SERVICING DETAILS FOR 1016 & 1018 DERIVED FROM IBI GROUP DRAWING "1016 DOERING STREET WELLESLEY PART OF LOT 61 ADDRESS" DATED JANUARY 31, 2011
5. SITE PLAN PROVIDED BY GSP GROUP DRAWING "dpc18275b.dwg" RECEIVED FEBRUARY 25, 2021.

BENCH MARKS :

BM #1
NAIL IN ASPHALT AS SHOWN ON PLAN
ELEV=355.26

BM #2
NAIL IN ASPHALT AS SHOWN ON PLAN
ELEV=352.35

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.

BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO THEM.

LICENSED PROFESSIONAL ENGINEER
March 5, 2021
S.J. PRIMMER
100141776
PROVINCE OF ONTARIO

NO.	DATE	REVISION DESCRIPTION	CHKD
6.	03/05/21	ISSUED FOR DRAFT PLAN CONDOMINIUM APPLICATION	S.J.P.
5.	06/11/20	ISSUED FOR FINAL ZONING APPROVAL	S.J.P.
4.	05/06/20	REVISED GRADING AROUND LOT 1018	S.J.P.
3.	03/13/20	REVISED AS PER TOWNSHIP COMMENTS	S.J.P.
2.	10/07/19	REVISED SITE PLAN AND ISSUED FOR APPROVAL	S.J.P.
1.	08/22/19	ISSUED FOR APPROVAL	S.J.P.

BluePlan ENGINEERING

GUELPH | OWEN SOUND | LISTOWEL | KITCHENER | LONDON | HAMILTON | GTA

330 TRILLIUM DRIVE, UNIT D, KITCHENER, ON N2E 3J2
TEL. 519-748-1440
www.gmblueplan.ca

1016 & 1018 DOERING STREET

JAMES FLYNN

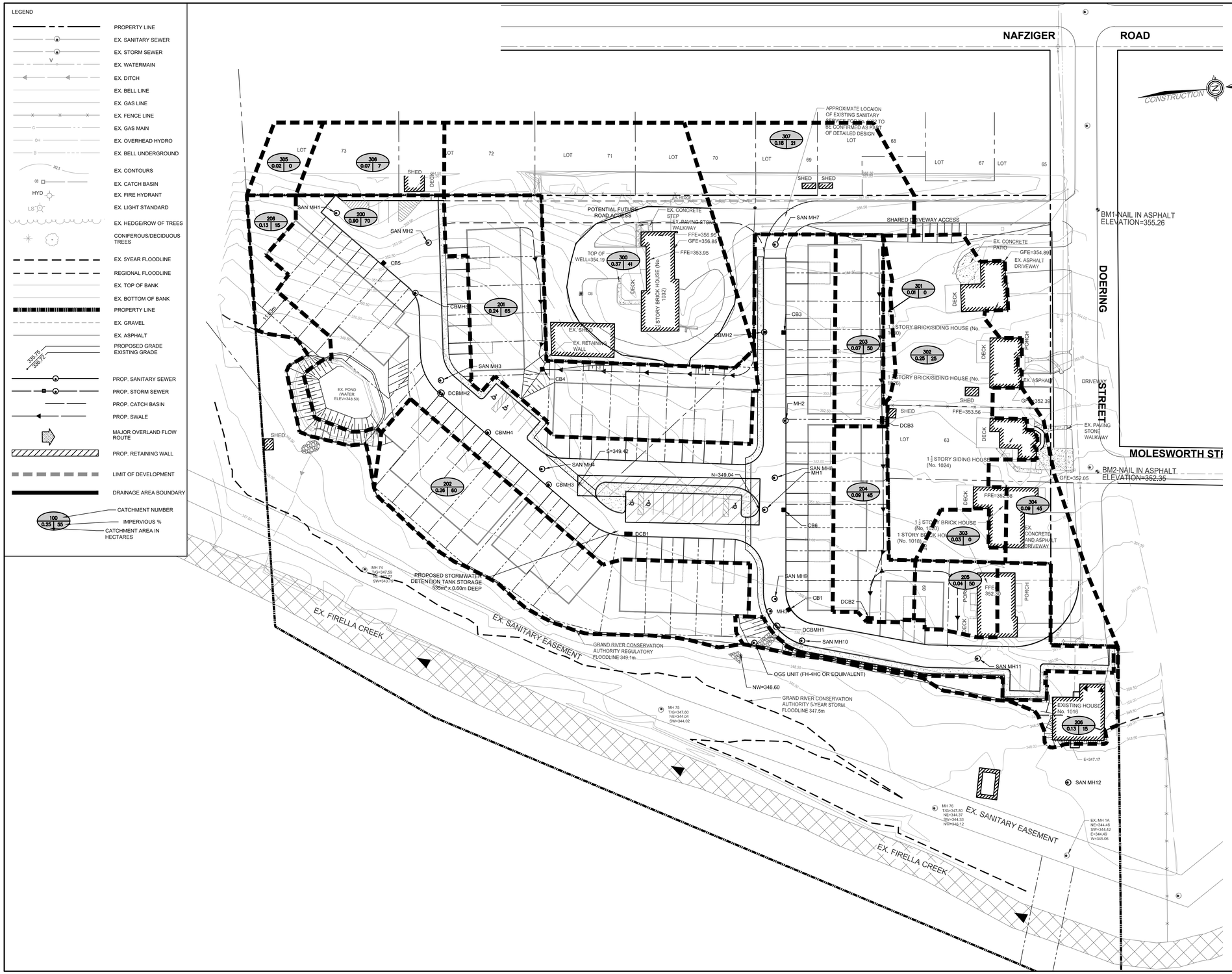
TOWNSHIP OF WELLESLEY

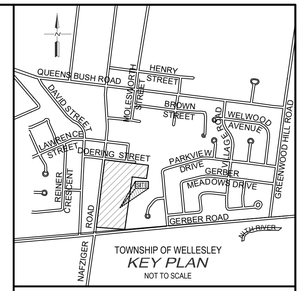
PRE DEVELOPMENT CATCHMENT AREA PLAN

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
M.T.	S.P.	418223	5
DESIGNED BY :	DATE :	SCALE :	
S.P.	JUNE 2020	1:500	

LEGEND

- PROPERTY LINE
- EX. SANITARY SEWER
- EX. STORM SEWER
- EX. WATERMAIN
- EX. DITCH
- EX. BELL LINE
- EX. GAS LINE
- EX. FENCE LINE
- EX. GAS MAIN
- EX. OVERHEAD HYDRO
- EX. BELL UNDERGROUND
- EX. CONTOURS
- EX. CATCH BASIN
- EX. FIRE HYDRANT
- EX. LIGHT STANDARD
- EX. HEDGE/ROW OF TREES
- CONIFEROUS/DECIDUOUS TREES
- EX. 5YEAR FLOODLINE
- REGIONAL FLOODLINE
- EX. TOP OF BANK
- EX. BOTTOM OF BANK
- PROPERTY LINE
- EX. GRAVEL
- EX. ASPHALT
- PROPOSED GRADE / EXISTING GRADE (e.g. 356.75 / 356.72)
- PROP. SANITARY SEWER
- PROP. STORM SEWER
- PROP. CATCH BASIN
- PROP. SWALE
- MAJOR OVERLAND FLOW ROUTE
- PROP. RETAINING WALL
- LIMIT OF DEVELOPMENT
- DRAINAGE AREA BOUNDARY
- CATCHMENT NUMBER
- IMPERVIOUS %
- CATCHMENT AREA IN HECTARES (e.g. 100 / 0.25 / 55)





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5. SITE PLAN PROVIDED BY GSP GROUP DRAWING "dpc18275b.dwg" RECEIVED FEBRUARY 25, 2021.

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NAIL IN ASPHALT AS SHOWN ON PLAN
ELEV=352.35

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LICENSED PROFESSIONAL ENGINEER
March 5, 2021
S.J. PRIMMER
100141776
PROVINCE OF ONTARIO

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5.	06/11/20	ISSUED FOR FINAL ZONING APPROVAL	S.J.P.
4.	05/06/20	REVISED GRADING AROUND LOT 1016	S.J.P.
3.	03/13/20	REVISED AS PER TOWNSHIP COMMENTS	S.J.P.
2.	10/07/19	REVISED SITE PLAN AND ISSUED FOR APPROVAL	S.J.P.
1.	08/22/19	ISSUED FOR APPROVAL	S.J.P.

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1016 & 1018 DOERING STREET

JAMES FLYNN

TOWNSHIP OF WELLESLEY

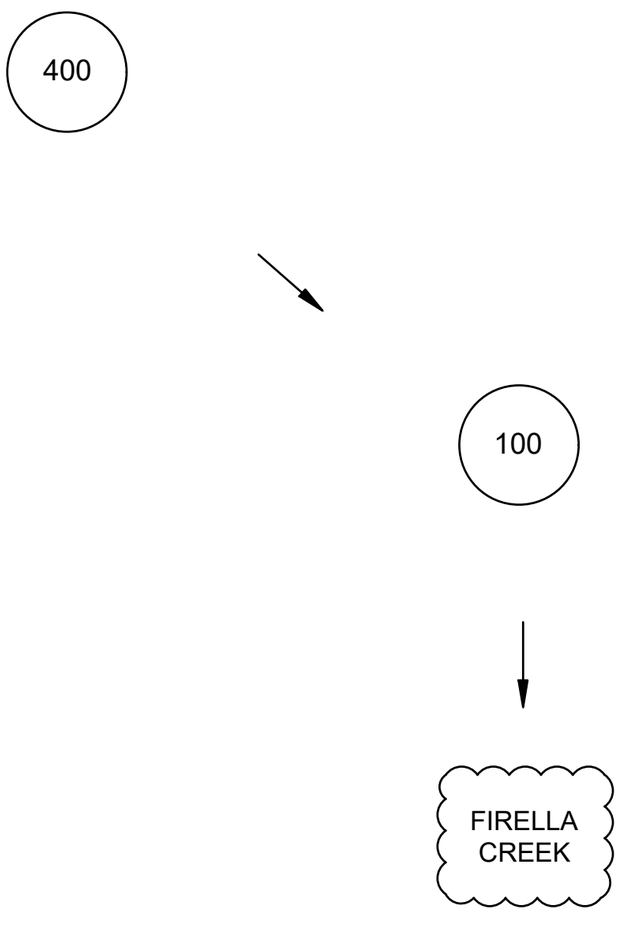
POST DEVELOPMENT CATCHMENT AREA PLAN

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
M.T.	S.P.	418223	6
DESIGNED BY :	DATE :	SCALE :	
S.P.	JUNE 2020	1:500	

APPENDIX C

Pre- and Post-Development Modelling Schematic and MIDUSS V2.25 Modelling Output

418223
STORMWATER MANAGEMENT REPORT
1016-1018 DOERING STREET
TOWNSHIP OF WELLESLEY



LEGEND

100 CATCHMENT

POND SWM FACILITY

CHANNEL CHANNEL

OUTLET B OUTLET

EXISTING CONDITION
FLOW SCHEMATIC

FIGURE C

BluePlan ENGINEERING

418223
MARCH 2021
Scale: N.T.S| NAD 1983 UTM Zone 17N

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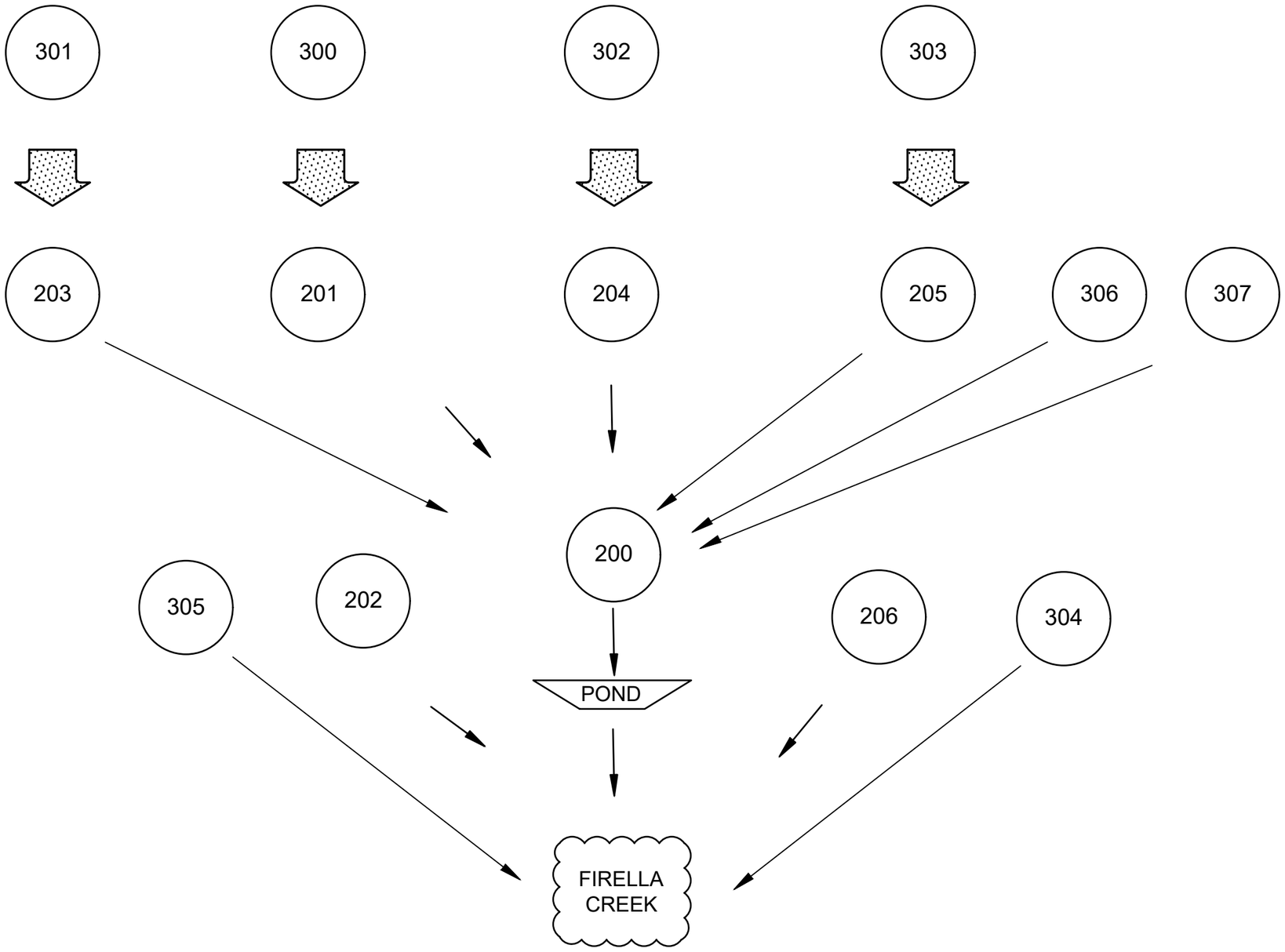
STORMWATER MANAGEMENT REPORT
1016-1018 DOERING STREET
TOWNSHIP OF WELLESLEY



LEGEND

100 CATCHMENT

POND SWM FACILITY

CHANNEL CHANNEL

OUTLET B OUTLET

PROPOSED CONDITION
FLOW SCHEMATIC

FIGURE D

BluePlan ENGINEERING

418223
MARCH 2021
Scale: N.T.S| NAD 1983 UTM Zone 17N

FILE:W:\Kitchener\418-2018\418223 - 1016-1018 Doering Street, Wellesley\Drawings\418223-FIGURES.dwg LAYOUT:P.FLOW
LAST SAVED BY:Mterpstra, 3/5/2021 8:15:30 AM PLOTTED BY:Michael Terpstra - GM BluePlan 3/5/2021 8:16:45 AM

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"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              \\gamsby.local\gmprojects\Kitchener\"
"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Pre"
"                Output filename:                                  5-Year1.out"
"                Licensee name:                                           GMBP"
"                Company                                                     "
"                Date & Time last used:                 3/1/2021 at 10:34:00 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1593.000   Coefficient A"
"       11.000   Constant B"
"        0.879   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          137.544    mm/hr"
"             Total depth                 47.265    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Development Site"
"       10.000   % Impervious"
"        1.700   Total Area"
"       45.000   Flow length"
"       15.000   Overland Slope"
"        1.530   Pervious Area"
"       45.000   Pervious length"
"       15.000   Pervious slope"
"        0.170   Impervious Area"
"       45.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.468     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           1.530      0.170      1.700      hectare"
"             Time of concentration  7.384      1.361      6.682      minutes"
"             Time to Centroid       93.633     83.086     92.404     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        723.15     80.35      803.50     c.m"
"             Rainfall losses        9.382      2.296      8.673      mm"
"             Runoff depth           37.883     44.969     38.591     mm"
"             Runoff volume          579.60     76.45      656.05     c.m"
"             Runoff coefficient     0.801      0.951      0.816      "
"             Maximum flow           0.426      0.055      0.468      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.468     0.468     0.000     0.000"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   North External Lands"
"       30.000   % Impervious"
"        0.380   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.266   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.114   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.103     0.468     0.000     0.000 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.266      0.114      0.380      hectare"
"             Time of concentration  5.310      0.979      3.866      minutes"
"             Time to Centroid       90.855     82.565     88.090     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        125.72     53.88      179.61     c.m"
"             Rainfall losses        9.430      3.082      7.525      mm"
"             Runoff depth           37.835     44.183     39.739     mm"
```

```
"             Runoff volume          100.64     50.37      151.01     c.m"
"             Runoff coefficient     0.800      0.935      0.841      "
"             Maximum flow           0.077      0.038      0.103      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.103     0.570     0.000     0.000"
" 33          CATCHMENT 401"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          401   West External Lands"
"       20.000   % Impervious"
"        0.660   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.528   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.132   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.185     0.570     0.000     0.000 c.m/sec"
"             Catchment 401          Pervious   Impervious Total Area "
"             Surface Area           0.528      0.132      0.660      hectare"
"             Time of concentration  4.313      0.795      3.526      minutes"
"             Time to Centroid       89.569     82.352     87.954     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        249.56     62.39      311.95     c.m"
"             Rainfall losses        9.593      3.817      8.438      mm"
"             Runoff depth           37.672     43.448     38.827     mm"
"             Runoff volume          198.91     57.35      256.26     c.m"
"             Runoff coefficient     0.797      0.919      0.821      "
"             Maximum flow           0.158      0.044      0.185      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.185     0.756     0.000     0.000"
```

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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              \\gamsby.local\gmprojects\Kitchener\"
"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Pre"
"                Output filename:                                  10-Year1.out"
"                Licensee name:                                          GMBP"
"                Company                                                    "
"                Date & Time last used:                 3/1/2021 at 10:35:08 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2221.000   Coefficient A"
"       12.000   Constant B"
"        0.908   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           167.447    mm/hr"
"             Total depth                  56.290    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Development Site"
"       10.000   % Impervious"
"        1.700   Total Area"
"       45.000   Flow length"
"       15.000   Overland Slope"
"        1.530   Pervious Area"
"       45.000   Pervious length"
"       15.000   Pervious slope"
"        0.170   Impervious Area"
"       45.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.594     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           1.530      0.170      1.700      hectare"
"             Time of concentration  6.821      1.258      6.189      minutes"
"             Time to Centroid       91.622     82.146     90.545     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        861.24     95.69      956.93     c.m"
"             Rainfall losses        9.755      2.596      9.039      mm"
"             Runoff depth           46.535     53.694     47.251     mm"
"             Runoff volume          711.99     91.28      803.27     c.m"
"             Runoff coefficient     0.827      0.954      0.839      "
"             Maximum flow           0.544      0.068      0.594      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.594     0.594     0.000     0.000"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   North External Lands"
"       30.000   % Impervious"
"        0.380   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.266   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.114   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.128     0.594     0.000     0.000 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.266      0.114      0.380      hectare"
"             Time of concentration  4.906      0.905      3.606      minutes"
"             Time to Centroid       89.084     81.683     86.680     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        149.73     64.17      213.90     c.m"
"             Rainfall losses        9.474      3.739      7.753      mm"
"             Runoff depth           46.816     52.551     48.537     mm"
```

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"             Runoff volume          124.53     59.91      184.44     c.m"
"             Runoff coefficient     0.832      0.934      0.862      "
"             Maximum flow           0.097      0.046      0.128      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.128     0.722     0.000     0.000"
" 33          CATCHMENT 401"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          401   West External Lands"
"       20.000   % Impervious"
"        0.660   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.528   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.132   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.227     0.722     0.000     0.000 c.m/sec"
"             Catchment 401          Pervious   Impervious Total Area "
"             Surface Area           0.528      0.132      0.660      hectare"
"             Time of concentration  3.985      0.735      3.279      minutes"
"             Time to Centroid       87.878     81.505     86.493     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        297.21     74.30      371.51     c.m"
"             Rainfall losses        9.872      4.742      8.846      mm"
"             Runoff depth           46.418     51.548     47.444     mm"
"             Runoff volume          245.09     68.04      313.13     c.m"
"             Runoff coefficient     0.825      0.916      0.843      "
"             Maximum flow           0.195      0.053      0.227      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.227     0.949     0.000     0.000"
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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              \\gamsby.local\gmprojects\Kitchener\"
"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Pre"
"                Output filename:                                    25mm1.out"
"                Licensee name:                                           GMBP"
"                Company                                                     "
"                Date & Time last used:                 3/1/2021 at 10:31:44 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      509.000   Coefficient A"
"        6.000   Constant B"
"        0.799   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity            73.899    mm/hr"
"             Total depth                  23.469    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Development Site"
"       10.000   % Impervious"
"        1.700   Total Area"
"       45.000   Flow length"
"       15.000   Overland Slope"
"        1.530   Pervious Area"
"       45.000   Pervious length"
"       15.000   Pervious slope"
"        0.170   Impervious Area"
"       45.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.136     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           1.530      0.170      1.700      hectare"
"             Time of concentration  10.261     1.745      9.038      minutes"
"             Time to Centroid       101.060    86.289     98.938     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        359.08     39.90      398.98     c.m"
"             Rainfall losses        9.132      1.825      8.401      mm"
"             Runoff depth           14.338     21.644     15.068     mm"
"             Runoff volume          219.36     36.80      256.16     c.m"
"             Runoff coefficient     0.611      0.922      0.642      "
"             Maximum flow           0.125      0.028      0.136      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.136     0.136     0.000     0.000"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   North External Lands"
"       30.000   % Impervious"
"        0.380   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.266   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.114   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.040     0.136     0.000     0.000 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.266      0.114      0.380      hectare"
"             Time of concentration  7.380      1.255      4.985      minutes"
"             Time to Centroid       97.262     85.661     92.726     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        62.43      26.75      89.18      c.m"
"             Rainfall losses        9.124      1.980      6.981      mm"
"             Runoff depth           14.345     21.489     16.488     mm"
```

```
"             Runoff volume          38.16      24.50      62.66      c.m"
"             Runoff coefficient     0.611      0.916      0.703      "
"             Maximum flow           0.026      0.020      0.040      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.040     0.167     0.000     0.000"
" 33          CATCHMENT 401"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          401   West External Lands"
"       20.000   % Impervious"
"        0.660   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.528   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.132   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.068     0.167     0.000     0.000 c.m/sec"
"             Catchment 401          Pervious   Impervious Total Area "
"             Surface Area           0.528      0.132      0.660      hectare"
"             Time of concentration  5.995      1.019      4.648      minutes"
"             Time to Centroid       95.375     85.205     92.622     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        123.92     30.98      154.90     c.m"
"             Rainfall losses        9.148      2.212      7.761      mm"
"             Runoff depth           14.321     21.257     15.708     mm"
"             Runoff volume          75.61      28.06      103.67     c.m"
"             Runoff coefficient     0.610      0.906      0.669      "
"             Maximum flow           0.054      0.023      0.068      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.068     0.234     0.000     0.000"
```

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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              \\gamsby.local\gmprojects\Kitchener\"
"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Pre"
"                Output filename:                                  25-Year1.out"
"                Licensee name:                                          GMBP"
"                Company                                                    "
"                Date & Time last used:                 3/1/2021 at 10:36:33 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3158.000   Coefficient A"
"       15.000   Constant B"
"        0.936   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           189.355    mm/hr"
"             Total depth                  68.266    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Development Site"
"       10.000   % Impervious"
"        1.700   Total Area"
"       45.000   Flow length"
"       15.000   Overland Slope"
"        1.530   Pervious Area"
"       45.000   Pervious length"
"       15.000   Pervious slope"
"        0.170   Impervious Area"
"       45.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.687     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           1.530      0.170      1.700      hectare"
"             Time of concentration  6.492      1.197      5.907      minutes"
"             Time to Centroid       90.678     81.775     89.695     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        1044.47    116.05     1160.53    c.m"
"             Rainfall losses        9.787      2.960      9.105      mm"
"             Runoff depth           58.479     65.306     59.161     mm"
"             Runoff volume          894.72     111.02     1005.75    c.m"
"             Runoff coefficient     0.857      0.957      0.867      "
"             Maximum flow           0.628      0.078      0.687      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.687     0.687     0.000     0.000"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   North External Lands"
"       30.000   % Impervious"
"        0.380   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.266   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.114   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.151     0.687     0.000     0.000 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.266      0.114      0.380      hectare"
"             Time of concentration  4.669      0.861      3.457      minutes"
"             Time to Centroid       88.274     81.326     86.063     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        181.59     77.82      259.41     c.m"
"             Rainfall losses        9.688      4.484      8.127      mm"
"             Runoff depth           58.579     63.782     60.140     mm"
```

```
"             Runoff volume          155.82     72.71      228.53     c.m"
"             Runoff coefficient     0.858      0.934      0.881      "
"             Maximum flow           0.115      0.052      0.151      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.151     0.838     0.000     0.000"
" 33          CATCHMENT 401"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          401   West External Lands"
"       20.000   % Impervious"
"        0.660   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.528   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.132   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.263     0.838     0.000     0.000 c.m/sec"
"             Catchment 401          Pervious   Impervious Total Area "
"             Surface Area           0.528      0.132      0.660      hectare"
"             Time of concentration  3.792      0.700      3.136      minutes"
"             Time to Centroid       87.185     81.232     85.922     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        360.45     90.11      450.56     c.m"
"             Rainfall losses        10.317     5.834      9.420      mm"
"             Runoff depth           57.950     62.432     58.846     mm"
"             Runoff volume          305.97     82.41      388.38     c.m"
"             Runoff coefficient     0.849      0.915      0.862      "
"             Maximum flow           0.224      0.060      0.263      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.263     1.100     0.000     0.000"
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"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Pre"
"                Output filename:                                  50-Year1.out"
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"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3886.000   Coefficient A"
"       16.000   Constant B"
"        0.950   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           213.371    mm/hr"
"             Total depth                  77.647    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Development Site"
"       10.000   % Impervious"
"        1.700   Total Area"
"       45.000   Flow length"
"       15.000   Overland Slope"
"        1.530   Pervious Area"
"       45.000   Pervious length"
"       15.000   Pervious slope"
"        0.170   Impervious Area"
"       45.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.794     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           1.530      0.170      1.700      hectare"
"             Time of concentration  6.187      1.142      5.641      minutes"
"             Time to Centroid       89.785     81.421     88.879     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        1188.01    132.00     1320.01    c.m"
"             Rainfall losses        9.672      3.340      9.039      mm"
"             Runoff depth           67.975     74.307     68.608     mm"
"             Runoff volume          1040.02    126.32     1166.34    c.m"
"             Runoff coefficient     0.875      0.957      0.884      "
"             Maximum flow           0.728      0.088      0.794      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.794     0.794     0.000     0.000"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   North External Lands"
"       30.000   % Impervious"
"        0.380   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.266   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.114   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.170     0.794     0.000     0.000 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.266      0.114      0.380      hectare"
"             Time of concentration  4.450      0.821      3.311      minutes"
"             Time to Centroid       87.558     81.012     85.503     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        206.54     88.52      295.06     c.m"
"             Rainfall losses        9.832      5.264      8.462      mm"
"             Runoff depth           67.816     72.383     69.186     mm"
```

```
"             Runoff volume          180.39     82.52      262.91     c.m"
"             Runoff coefficient     0.873      0.932      0.891      "
"             Maximum flow           0.130      0.059      0.170      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.170     0.964     0.000     0.000"
" 33          CATCHMENT 401"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          401   West External Lands"
"       20.000   % Impervious"
"        0.660   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.528   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.132   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.294     0.964     0.000     0.000 c.m/sec"
"             Catchment 401          Pervious   Impervious Total Area "
"             Surface Area           0.528      0.132      0.660      hectare"
"             Time of concentration  3.615      0.667      2.998      minutes"
"             Time to Centroid       86.530     80.932     85.359     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        409.98     102.49     512.47     c.m"
"             Rainfall losses        10.786     6.876      10.004     mm"
"             Runoff depth           66.862     70.771     67.644     mm"
"             Runoff volume          353.03     93.42      446.45     c.m"
"             Runoff coefficient     0.861      0.911      0.871      "
"             Maximum flow           0.251      0.068      0.294      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.294     1.258     0.000     0.000"
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"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Pre"
"                Output filename:                                  100-Year1.out"
"                Licensee name:                                            GMBP"
"                Company                                                      "
"                Date & Time last used:                 3/1/2021 at 10:38:32 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4688.000   Coefficient A"
"       17.000   Constant B"
"        0.962   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           236.711    mm/hr"
"             Total depth                  87.079    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Development Site"
"       10.000   % Impervious"
"        1.700   Total Area"
"       45.000   Flow length"
"       15.000   Overland Slope"
"        1.530   Pervious Area"
"       45.000   Pervious length"
"       15.000   Pervious slope"
"        0.170   Impervious Area"
"       45.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.899     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           1.530      0.170      1.700      hectare"
"             Time of concentration  5.934      1.095      5.417      minutes"
"             Time to Centroid       89.155     81.145     88.299     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        1332.31    148.03     1480.35    c.m"
"             Rainfall losses        9.734      3.783      9.139      mm"
"             Runoff depth           77.346     83.296     77.941     mm"
"             Runoff volume          1183.39    141.60     1324.99    c.m"
"             Runoff coefficient     0.888      0.957      0.895      "
"             Maximum flow           0.826      0.098      0.899      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.899     0.899     0.000     0.000"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   North External Lands"
"       30.000   % Impervious"
"        0.380   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.266   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.114   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.189     0.899     0.000     0.000 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.266      0.114      0.380      hectare"
"             Time of concentration  4.268      0.788      3.188      minutes"
"             Time to Centroid       86.990     80.756     85.055     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        231.63     99.27      330.90     c.m"
"             Rainfall losses        9.981      6.089      8.814      mm"
"             Runoff depth           77.098     80.991     78.266     mm"
```

```
"             Runoff volume          205.08     92.33      297.41     c.m"
"             Runoff coefficient     0.885      0.930      0.899      "
"             Maximum flow           0.145      0.065      0.189      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.189     1.088     0.000     0.000"
" 33          CATCHMENT 401"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          401   West External Lands"
"       20.000   % Impervious"
"        0.660   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.528   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.132   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.333     1.088     0.000     0.000 c.m/sec"
"             Catchment 401          Pervious   Impervious Total Area "
"             Surface Area           0.528      0.132      0.660      hectare"
"             Time of concentration  3.467      0.640      2.884      minutes"
"             Time to Centroid       85.976     80.691     84.887     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        459.78     114.94     574.72     c.m"
"             Rainfall losses        10.881     7.996      10.304     mm"
"             Runoff depth           76.198     79.083     76.775     mm"
"             Runoff volume          402.33     104.39     506.72     c.m"
"             Runoff coefficient     0.875      0.908      0.882      "
"             Maximum flow           0.279      0.075      0.333      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.333     1.415     0.000     0.000"
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"                MIDUSS Output ----------------------------------------------->"
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"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
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"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Post"
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"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1593.000   Coefficient A"
"       11.000   Constant B"
"        0.879   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          137.544    mm/hr"
"             Total depth                 47.265    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   External Drainage to 201"
"       41.000   % Impervious"
"        0.370   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.218   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.152   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.099     0.000     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.218      0.152      0.370      hectare"
"             Time of concentration  4.313      0.795      2.748      minutes"
"             Time to Centroid       89.569     82.352     86.358     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        103.18     71.70      174.88     c.m"
"             Rainfall losses        9.593      3.817      7.225      mm"
"             Runoff depth           37.672     43.448     40.040     mm"
"             Runoff volume          82.24      65.91      148.15     c.m"
"             Runoff coefficient     0.797      0.919      0.847      "
"             Maximum flow           0.065      0.050      0.099      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.099     0.099     0.000     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Site Drainage to CB4"
"       65.000   % Impervious"
"        0.240   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.084   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.076     0.099     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.084      0.156      0.240      hectare"
"             Time of concentration  2.218      0.409      1.011      minutes"
"             Time to Centroid       86.620     82.218     83.684     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        39.70      73.73      113.44     c.m"
"             Rainfall losses        9.793      6.848      7.878      mm"
"             Runoff depth           37.472     40.417     39.386     mm"
```

```
"             Runoff volume          31.48      63.05      94.53      c.m"
"             Runoff coefficient     0.793      0.855      0.833      "
"             Maximum flow           0.025      0.051      0.076      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.076     0.175     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.076     0.175     0.175     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.175    c.m/sec"
"             Hydrograph volume           242.676    c.m"
"                     0.076     0.175     0.175     0.175"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.076     0.000     0.175     0.175"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          301   External Drainage to 203"
"        0.000   % Impervious"
"        0.010   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.010   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.003     0.000     0.175     0.175 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.010      0.000      0.010      hectare"
"             Time of concentration  5.678      1.046      5.678      minutes"
"             Time to Centroid       91.337     82.678     91.337     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
```

```
"             Rainfall volume        4.73       0.00       4.73       c.m"
"             Rainfall losses        9.381      2.880      9.381      mm"
"             Runoff depth           37.883     44.385     37.883     mm"
"             Runoff volume          3.79       0.00       3.79       c.m"
"             Runoff coefficient     0.802      0.000      0.802      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.003     0.003     0.175     0.175"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   North Swale"
"       50.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.035   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.035   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.022     0.003     0.175     0.175 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.035      0.035      0.070      hectare"
"             Time of concentration  2.218      0.409      1.279      minutes"
"             Time to Centroid       86.620     82.218     84.335     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        16.54      16.54      33.09      c.m"
"             Rainfall losses        9.793      6.848      8.320      mm"
"             Runoff depth           37.472     40.417     38.945     mm"
"             Runoff volume          13.12      14.15      27.26      c.m"
"             Runoff coefficient     0.793      0.855      0.824      "
"             Maximum flow           0.010      0.011      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.022     0.024     0.175     0.175"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.022     0.024     0.024     0.175"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.198    c.m/sec"
"             Hydrograph volume           273.725    c.m"
"                     0.022     0.024     0.024     0.198"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.022     0.000     0.024     0.198"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          302   External Drainage to 204"
"        0.000   % Impervious"
"        0.250   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.250   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.072     0.000     0.024     0.198 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.250      0.000      0.250      hectare"
"             Time of concentration  5.678      1.046      5.678      minutes"
"             Time to Centroid       91.337     82.678     91.337     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        118.16     0.00       118.16     c.m"
"             Rainfall losses        9.381      2.880      9.381      mm"
"             Runoff depth           37.883     44.385     37.883     mm"
"             Runoff volume          94.71      0.00       94.71      c.m"
"             Runoff coefficient     0.802      0.000      0.802      "
"             Maximum flow           0.072      0.000      0.072      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.072     0.072     0.024     0.198"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          204   Site Drainage to DCB2"
"       45.000   % Impervious"
"        0.090   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.050   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.041   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.028     0.072     0.024     0.198 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.041      0.090      hectare"
"             Time of concentration  2.218      0.409      1.370      minutes"
"             Time to Centroid       86.620     82.218     84.556     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        23.40      19.14      42.54      c.m"
"             Rainfall losses        9.793      6.848      8.467      mm"
"             Runoff depth           37.472     40.417     38.797     mm"
"             Runoff volume          18.55      16.37      34.92      c.m"
"             Runoff coefficient     0.793      0.855      0.821      "
"             Maximum flow           0.015      0.013      0.028      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.028     0.092     0.024     0.198"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.028     0.092     0.092     0.198"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.268    c.m/sec"
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"             Hydrograph volume           403.351    c.m"
"                    0.028     0.092     0.092     0.268"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.028     0.000     0.092     0.268"
" 33          CATCHMENT 303"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          303   External Drainage to 205"
"        0.000   % Impervious"
"        0.030   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.030   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.009     0.000     0.092     0.268 c.m/sec"
"             Catchment 303          Pervious   Impervious Total Area "
"             Surface Area           0.030      0.000      0.030      hectare"
"             Time of concentration  5.310      0.979      5.310      minutes"
"             Time to Centroid       90.855     82.565     90.855     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        14.18      0.00       14.18      c.m"
"             Rainfall losses        9.430      3.082      9.430      mm"
"             Runoff depth           37.835     44.183     37.835     mm"
"             Runoff volume          11.35      0.00       11.35      c.m"
"             Runoff coefficient     0.800      0.000      0.800      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.009     0.009     0.092     0.268"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          205   Site Drainage to Swale"
```

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"       50.000   % Impervious"
"        0.040   Total Area"
"        8.000   Flow length"
"       15.000   Overland Slope"
"        0.020   Pervious Area"
"        8.000   Pervious length"
"       15.000   Pervious slope"
"        0.020   Impervious Area"
"        8.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.012     0.009     0.092     0.268 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.020      0.040      hectare"
"             Time of concentration  2.619      0.483      1.500      minutes"
"             Time to Centroid       87.240     82.378     84.694     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        9.45       9.45       18.91      c.m"
"             Rainfall losses        9.920      6.204      8.062      mm"
"             Runoff depth           37.345     41.061     39.203     mm"
"             Runoff volume          7.47       8.21       15.68      c.m"
"             Runoff coefficient     0.790      0.869      0.829      "
"             Maximum flow           0.006      0.007      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.012     0.018     0.092     0.268"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.012     0.018     0.018     0.268"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.286    c.m/sec"
"             Hydrograph volume           430.383    c.m"
"                    0.012     0.018     0.018     0.286"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.286    c.m/sec"
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"             Hydrograph volume           430.383    c.m"
"                     0.012     0.286     0.018     0.000"
" 33          CATCHMENT 306"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          306   External Drainage to 200"
"        7.000   % Impervious"
"        0.070   Total Area"
"       30.000   Flow length"
"        7.000   Overland Slope"
"        0.065   Pervious Area"
"       30.000   Pervious length"
"        7.000   Pervious slope"
"        0.005   Impervious Area"
"       30.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.019     0.286     0.018     0.000 c.m/sec"
"             Catchment 306          Pervious   Impervious Total Area "
"             Surface Area           0.065      0.005      0.070      hectare"
"             Time of concentration  7.276      1.341      6.789      minutes"
"             Time to Centroid       93.494     83.068     92.639     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        30.77      2.32       33.09      c.m"
"             Rainfall losses        9.408      2.319      8.912      mm"
"             Runoff depth           37.857     44.945     38.353     mm"
"             Runoff volume          24.64      2.20       26.85      c.m"
"             Runoff coefficient     0.801      0.951      0.811      "
"             Maximum flow           0.018      0.002      0.019      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.019     0.295     0.018     0.000"
" 33          CATCHMENT 307"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          307   External Drainage to 200"
"       21.000   % Impervious"
"        0.180   Total Area"
"       10.000   Flow length"
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"        4.000   Overland Slope"
"        0.142   Pervious Area"
"       10.000   Pervious length"
"        4.000   Pervious slope"
"        0.038   Impervious Area"
"       10.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.050     0.295     0.018     0.000 c.m/sec"
"             Catchment 307          Pervious   Impervious Total Area "
"             Surface Area           0.142      0.038      0.180      hectare"
"             Time of concentration  4.452      0.820      3.599      minutes"
"             Time to Centroid       89.737     82.361     88.004     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        67.21      17.87      85.08      c.m"
"             Rainfall losses        9.551      3.697      8.321      mm"
"             Runoff depth           37.714     43.568     38.943     mm"
"             Runoff volume          53.63      16.47      70.10      c.m"
"             Runoff coefficient     0.798      0.922      0.824      "
"             Maximum flow           0.042      0.013      0.050      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.050     0.345     0.018     0.000"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Site Development"
"       70.000   % Impervious"
"        0.900   Total Area"
"       10.000   Flow length"
"        5.000   Overland Slope"
"        0.270   Pervious Area"
"       10.000   Pervious length"
"        5.000   Pervious slope"
"        0.630   Impervious Area"
"       10.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
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"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.270     0.345     0.018     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.270      0.630      0.900      hectare"
"             Time of concentration  4.164      0.767      1.688      minutes"
"             Time to Centroid       89.363     82.356     84.257     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        127.61     297.77     425.38     c.m"
"             Rainfall losses        9.662      3.954      5.666      mm"
"             Runoff depth           37.603     43.311     41.599     mm"
"             Runoff volume          101.53     272.86     374.39     c.m"
"             Runoff coefficient     0.796      0.916      0.880      "
"             Maximum flow           0.081      0.209      0.270      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.270     0.609     0.018     0.000"
" 54          POND DESIGN"
"        0.609   Current peak flow    c.m/sec"
"        0.129   Target outflow    c.m/sec"
"        901.7   Hydrograph volume    c.m"
"          23.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                348.710     0.000     0.000"
"                348.810   0.02640    0.6000"
"                348.910   0.03730     1.200"
"                349.010   0.04570     2.450"
"                349.110   0.05280     4.170"
"                349.210   0.05900     6.000"
"                349.310   0.06470     7.910"
"                349.410   0.06990     8.660"
"                349.440   0.07130     9.030"
"                349.510    0.1865    48.060"
"                349.610    0.2535   103.470"
"                349.710    0.3031   158.990"
"                349.810    0.3447   214.590"
"                349.910    0.3812   270.130"
"                350.010    0.4143   325.130"
"                350.060    0.4298   352.880"
"                350.080    0.4359   353.230"
"                350.110    0.4448   371.700"
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"               350.140    0.4535   399.470"
"               350.170    0.4620   436.720"
"               350.200    0.4704   477.160"
"               350.220    0.5143   477.510"
"               350.320    0.9381   478.520"
"            Peak outflow                  0.343    c.m/sec"
"            Maximum level              349.806    metre"
"            Maximum storage            212.418    c.m"
"            Centroidal lag               1.537   hours"
"                 0.270     0.609     0.343     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    1001"
"           6   Combine "
"        1001   Node #"
"               Total Site Runoff"
"            Maximum flow                  0.343    c.m/sec"
"            Hydrograph volume           899.794    c.m"
"                    0.270     0.609     0.343     0.343"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.270     0.000     0.343     0.343"
" 33         CATCHMENT 304"
"           1   Triangular SCS"
"           1   Equal length"
"           2   Horton equation"
"         304   External Drainage to House 1016"
"      45.000   % Impervious"
"       0.090   Total Area"
"      10.000   Flow length"
"       6.000   Overland Slope"
"       0.050   Pervious Area"
"      10.000   Pervious length"
"       6.000   Pervious slope"
"       0.041   Impervious Area"
"      10.000   Impervious length"
"       6.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"       6.000   Pervious Max.infiltration"
"       1.000   Pervious Min.infiltration"
"       0.250   Pervious Lag constant (hours)"
"       5.000   Pervious Depression storage"
"       0.015   Impervious Manning 'n'"
"       0.000   Impervious Max.infiltration"
"       0.000   Impervious Min.infiltration"
"       0.050   Impervious Lag constant (hours)"
"       1.500   Impervious Depression storage"
"                    0.025     0.000     0.343     0.343 c.m/sec"
"            Catchment 304          Pervious   Impervious Total Area "
"            Surface Area           0.050      0.041      0.090      hectare"
"            Time of concentration  3.942      0.727      2.384      minutes"
"            Time to Centroid       89.083     82.385     85.837     minutes"
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"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        23.40      19.14      42.54      c.m"
"             Rainfall losses        9.768      4.175      7.251      mm"
"             Runoff depth           37.497     43.090     40.014     mm"
"             Runoff volume          18.56      17.45      36.01      c.m"
"             Runoff coefficient     0.793      0.912      0.847      "
"             Maximum flow           0.015      0.013      0.025      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.025     0.025     0.343     0.343"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.025     0.025     0.025     0.343"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.356    c.m/sec"
"             Hydrograph volume           935.806    c.m"
"                    0.025     0.025     0.025     0.356"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.025     0.000     0.025     0.356"
" 33          CATCHMENT 305"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          305   External Drainage from 206"
"        0.000   % Impervious"
"        0.020   Total Area"
"       20.000   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"       20.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.006     0.000     0.025     0.356 c.m/sec"
"             Catchment 305          Pervious   Impervious Total Area "
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"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  5.481      1.010      5.481      minutes"
"             Time to Centroid       91.093     82.618     91.093     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        9.45       0.00       9.45       c.m"
"             Rainfall losses        9.414      2.986      9.414      mm"
"             Runoff depth           37.851     44.279     37.851     mm"
"             Runoff volume          7.57       0.00       7.57       c.m"
"             Runoff coefficient     0.801      0.000      0.801      "
"             Maximum flow           0.006      0.000      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.006     0.006     0.025     0.356"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          206   Uncontrolled Sheet Flow"
"        0.000   % Impervious"
"        0.130   Total Area"
"       10.000   Flow length"
"        3.000   Overland Slope"
"        0.130   Pervious Area"
"       10.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.038     0.006     0.025     0.356 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  4.853      0.894      4.853      minutes"
"             Time to Centroid       90.269     82.439     90.269     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        61.44      0.00       61.44      c.m"
"             Rainfall losses        9.417      3.385      9.417      mm"
"             Runoff depth           37.848     43.880     37.848     mm"
"             Runoff volume          49.20      0.00       49.20      c.m"
"             Runoff coefficient     0.801      0.000      0.801      "
"             Maximum flow           0.038      0.000      0.038      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.038     0.044     0.025     0.356"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.038     0.044     0.044     0.356"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.385    c.m/sec"
"             Hydrograph volume           992.579    c.m"
"                     0.038     0.044     0.044     0.385"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.038     0.000     0.044     0.385"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Site Development Area, Uncontrolled"
"       60.000   % Impervious"
"        0.260   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.104   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.082     0.000     0.044     0.385 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.104      0.156      0.260      hectare"
"             Time of concentration  2.218      0.409      1.100      minutes"
"             Time to Centroid       86.620     82.218     83.899     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        49.16      73.73      122.89     c.m"
"             Rainfall losses        9.793      6.848      8.026      mm"
"             Runoff depth           37.472     40.417     39.239     mm"
```

```
"             Runoff volume          38.97      63.05      102.02     c.m"
"             Runoff coefficient     0.793      0.855      0.830      "
"             Maximum flow           0.031      0.051      0.082      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.082     0.082     0.044     0.385"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.082     0.082     0.082     0.385"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.441    c.m/sec"
"             Hydrograph volume         1094.600    c.m"
"                    0.082     0.082     0.082     0.441"
" 40          HYDROGRAPH   Confluence    1001"
"            7   Confluence "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.441    c.m/sec"
"             Hydrograph volume         1094.600    c.m"
"                    0.082     0.441     0.082     0.000"
```

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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              \\gamsby.local\gmprojects\Kitchener\"
"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Post"
"                Output filename:                                  10yr_Post1.out"
"                Licensee name:                                             GMBP"
"                Company                                                       "
"                Date & Time last used:                 3/4/2021 at 2:14:14 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2221.000   Coefficient A"
"       12.000   Constant B"
"        0.908   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           167.447    mm/hr"
"             Total depth                  56.290    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   External Drainage to 201"
"       41.000   % Impervious"
"        0.370   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.218   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.152   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.126     0.000     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.218      0.152      0.370      hectare"
"             Time of concentration  3.985      0.735      2.569      minutes"
"             Time to Centroid       87.878     81.505     85.102     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        122.88     85.39      208.27     c.m"
"             Rainfall losses        9.872      4.742      7.769      mm"
"             Runoff depth           46.418     51.548     48.521     mm"
"             Runoff volume          101.33     78.20      179.53     c.m"
"             Runoff coefficient     0.825      0.916      0.862      "
"             Maximum flow           0.080      0.061      0.126      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.126     0.126     0.000     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Site Drainage to CB4"
"       65.000   % Impervious"
"        0.240   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.084   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.093     0.126     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.084      0.156      0.240      hectare"
"             Time of concentration  2.049      0.378      0.950      minutes"
"             Time to Centroid       85.140     81.253     82.585     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        47.28      87.81      135.10     c.m"
"             Rainfall losses        9.790      8.233      8.778      mm"
"             Runoff depth           46.500     48.058     47.512     mm"
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"             Runoff volume          39.06      74.97      114.03     c.m"
"             Runoff coefficient     0.826      0.854      0.844      "
"             Maximum flow           0.031      0.062      0.093      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.093     0.219     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.093     0.219     0.219     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.219    c.m/sec"
"             Hydrograph volume           293.559    c.m"
"                     0.093     0.219     0.219     0.219"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.093     0.000     0.219     0.219"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          301   External Drainage to 203"
"        0.000   % Impervious"
"        0.010   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.010   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.004     0.000     0.219     0.219 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.010      0.000      0.010      hectare"
"             Time of concentration  5.245      0.967      5.245      minutes"
"             Time to Centroid       89.495     81.780     89.495     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
```

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"             Rainfall volume        5.63       0.00       5.63       c.m"
"             Rainfall losses        9.482      3.459      9.482      mm"
"             Runoff depth           46.808     52.831     46.808     mm"
"             Runoff volume          4.68       0.00       4.68       c.m"
"             Runoff coefficient     0.832      0.000      0.832      "
"             Maximum flow           0.004      0.000      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.004     0.004     0.219     0.219"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   North Swale"
"       50.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.035   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.035   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.027     0.004     0.219     0.219 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.035      0.035      0.070      hectare"
"             Time of concentration  2.049      0.378      1.200      minutes"
"             Time to Centroid       85.140     81.253     83.165     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        19.70      19.70      39.40      c.m"
"             Rainfall losses        9.790      8.233      9.012      mm"
"             Runoff depth           46.500     48.058     47.279     mm"
"             Runoff volume          16.27      16.82      33.10      c.m"
"             Runoff coefficient     0.826      0.854      0.840      "
"             Maximum flow           0.013      0.014      0.027      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.027     0.029     0.219     0.219"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.027     0.029     0.029     0.219"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.248    c.m/sec"
"             Hydrograph volume           331.335    c.m"
"                     0.027     0.029     0.029     0.248"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.027     0.000     0.029     0.248"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          302   External Drainage to 204"
"        0.000   % Impervious"
"        0.250   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.250   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.091     0.000     0.029     0.248 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.250      0.000      0.250      hectare"
"             Time of concentration  5.245      0.967      5.245      minutes"
"             Time to Centroid       89.495     81.780     89.495     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        140.73     0.00       140.73     c.m"
"             Rainfall losses        9.482      3.459      9.482      mm"
"             Runoff depth           46.808     52.831     46.808     mm"
"             Runoff volume          117.02     0.00       117.02     c.m"
"             Runoff coefficient     0.832      0.000      0.832      "
"             Maximum flow           0.091      0.000      0.091      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.091     0.091     0.029     0.248"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          204   Site Drainage to DCB2"
"       45.000   % Impervious"
"        0.090   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.050   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.041   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.034     0.091     0.029     0.248 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.041      0.090      hectare"
"             Time of concentration  2.049      0.378      1.283      minutes"
"             Time to Centroid       85.140     81.253     83.359     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        27.86      22.80      50.66      c.m"
"             Rainfall losses        9.790      8.233      9.089      mm"
"             Runoff depth           46.500     48.058     47.201     mm"
"             Runoff volume          23.02      19.46      42.48      c.m"
"             Runoff coefficient     0.826      0.854      0.839      "
"             Maximum flow           0.018      0.016      0.034      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.034     0.116     0.029     0.248"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.034     0.116     0.116     0.248"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.344    c.m/sec"
```

```
"             Hydrograph volume           490.835    c.m"
"                    0.034     0.116     0.116     0.344"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.034     0.000     0.116     0.344"
" 33          CATCHMENT 303"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          303   External Drainage to 205"
"        0.000   % Impervious"
"        0.030   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.030   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.011     0.000     0.116     0.344 c.m/sec"
"             Catchment 303          Pervious   Impervious Total Area "
"             Surface Area           0.030      0.000      0.030      hectare"
"             Time of concentration  4.906      0.905      4.906      minutes"
"             Time to Centroid       89.084     81.683     89.084     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        16.89      0.00       16.89      c.m"
"             Rainfall losses        9.474      3.739      9.474      mm"
"             Runoff depth           46.816     52.551     46.816     mm"
"             Runoff volume          14.04      0.00       14.04      c.m"
"             Runoff coefficient     0.832      0.000      0.832      "
"             Maximum flow           0.011      0.000      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.011     0.011     0.116     0.344"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          205   Site Drainage to Swale"
```

```
"       50.000   % Impervious"
"        0.040   Total Area"
"        8.000   Flow length"
"       15.000   Overland Slope"
"        0.020   Pervious Area"
"        8.000   Pervious length"
"       15.000   Pervious slope"
"        0.020   Impervious Area"
"        8.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.015     0.011     0.116     0.344 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.020      0.040      hectare"
"             Time of concentration  2.420      0.446      1.407      minutes"
"             Time to Centroid       85.708     81.427     83.511     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        11.26      11.26      22.52      c.m"
"             Rainfall losses        10.058     7.585      8.822      mm"
"             Runoff depth           46.232     48.705     47.469     mm"
"             Runoff volume          9.25       9.74       18.99      c.m"
"             Runoff coefficient     0.821      0.865      0.843      "
"             Maximum flow           0.007      0.008      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.015     0.023     0.116     0.344"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.015     0.023     0.023     0.344"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.367    c.m/sec"
"             Hydrograph volume           523.867    c.m"
"                     0.015     0.023     0.023     0.367"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.367    c.m/sec"
```

```
"             Hydrograph volume           523.867    c.m"
"                     0.015     0.367     0.023     0.000"
" 33          CATCHMENT 306"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          306   External Drainage to 200"
"        7.000   % Impervious"
"        0.070   Total Area"
"       30.000   Flow length"
"        7.000   Overland Slope"
"        0.065   Pervious Area"
"       30.000   Pervious length"
"        7.000   Pervious slope"
"        0.005   Impervious Area"
"       30.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.025     0.367     0.023     0.000 c.m/sec"
"             Catchment 306          Pervious   Impervious Total Area "
"             Surface Area           0.065      0.005      0.070      hectare"
"             Time of concentration  6.722      1.240      6.284      minutes"
"             Time to Centroid       91.492     82.129     90.744     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        36.64      2.76       39.40      c.m"
"             Rainfall losses        9.768      2.627      9.268      mm"
"             Runoff depth           46.522     53.663     47.022     mm"
"             Runoff volume          30.29      2.63       32.92      c.m"
"             Runoff coefficient     0.826      0.953      0.835      "
"             Maximum flow           0.023      0.002      0.025      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.025     0.380     0.023     0.000"
" 33          CATCHMENT 307"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          307   External Drainage to 200"
"       21.000   % Impervious"
"        0.180   Total Area"
"       10.000   Flow length"
```

```
"        4.000   Overland Slope"
"        0.142   Pervious Area"
"       10.000   Pervious length"
"        4.000   Pervious slope"
"        0.038   Impervious Area"
"       10.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.062     0.380     0.023     0.000 c.m/sec"
"             Catchment 307          Pervious   Impervious Total Area "
"             Surface Area           0.142      0.038      0.180      hectare"
"             Time of concentration  4.113      0.758      3.347      minutes"
"             Time to Centroid       88.042     81.510     86.552     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        80.04      21.28      101.32     c.m"
"             Rainfall losses        9.796      4.577      8.700      mm"
"             Runoff depth           46.494     51.713     47.590     mm"
"             Runoff volume          66.11      19.55      85.66      c.m"
"             Runoff coefficient     0.826      0.919      0.845      "
"             Maximum flow           0.053      0.015      0.062      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.062     0.437     0.023     0.000"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Site Development"
"       70.000   % Impervious"
"        0.900   Total Area"
"       10.000   Flow length"
"        5.000   Overland Slope"
"        0.270   Pervious Area"
"       10.000   Pervious length"
"        5.000   Pervious slope"
"        0.630   Impervious Area"
"       10.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
```

```
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.336     0.437     0.023     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.270      0.630      0.900      hectare"
"             Time of concentration  3.846      0.709      1.583      minutes"
"             Time to Centroid       87.721     81.512     83.243     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        151.98     354.63     506.61     c.m"
"             Rainfall losses        9.995      4.929      6.449      mm"
"             Runoff depth           46.295     51.361     49.841     mm"
"             Runoff volume          125.00     323.57     448.57     c.m"
"             Runoff coefficient     0.822      0.912      0.885      "
"             Maximum flow           0.099      0.254      0.336      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.336     0.773     0.023     0.000"
" 54          POND DESIGN"
"        0.773   Current peak flow    c.m/sec"
"        0.129   Target outflow    c.m/sec"
"       1091.0   Hydrograph volume    c.m"
"          23.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                348.710     0.000     0.000"
"                348.810   0.02640    0.6000"
"                348.910   0.03730     1.200"
"                349.010   0.04570     2.450"
"                349.110   0.05280     4.170"
"                349.210   0.05900     6.000"
"                349.310   0.06470     7.910"
"                349.410   0.06990     8.660"
"                349.440   0.07130     9.030"
"                349.510    0.1865    48.060"
"                349.610    0.2535   103.470"
"                349.710    0.3031   158.990"
"                349.810    0.3447   214.590"
"                349.910    0.3812   270.130"
"                350.010    0.4143   325.130"
"                350.060    0.4298   352.880"
"                350.080    0.4359   353.230"
"                350.110    0.4448   371.700"
```

```
"               350.140    0.4535   399.470"
"               350.170    0.4620   436.720"
"               350.200    0.4704   477.160"
"               350.220    0.5143   477.510"
"               350.320    0.9381   478.520"
"            Peak outflow                  0.394    c.m/sec"
"            Maximum level               349.949    metre"
"            Maximum storage             291.437    c.m"
"            Centroidal lag                1.540   hours"
"                 0.336     0.773     0.394     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    1001"
"           6   Combine "
"        1001   Node #"
"               Total Site Runoff"
"            Maximum flow                  0.394    c.m/sec"
"            Hydrograph volume          1089.481    c.m"
"                    0.336     0.773     0.394     0.394"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.336     0.000     0.394     0.394"
" 33         CATCHMENT 304"
"           1   Triangular SCS"
"           1   Equal length"
"           2   Horton equation"
"         304   External Drainage to House 1016"
"      45.000   % Impervious"
"       0.090   Total Area"
"      10.000   Flow length"
"       6.000   Overland Slope"
"       0.050   Pervious Area"
"      10.000   Pervious length"
"       6.000   Pervious slope"
"       0.041   Impervious Area"
"      10.000   Impervious length"
"       6.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"       6.000   Pervious Max.infiltration"
"       1.000   Pervious Min.infiltration"
"       0.250   Pervious Lag constant (hours)"
"       5.000   Pervious Depression storage"
"       0.015   Impervious Manning 'n'"
"       0.000   Impervious Max.infiltration"
"       0.000   Impervious Min.infiltration"
"       0.050   Impervious Lag constant (hours)"
"       1.500   Impervious Depression storage"
"                    0.032     0.000     0.394     0.394 c.m/sec"
"            Catchment 304          Pervious   Impervious Total Area "
"            Surface Area           0.050      0.041      0.090      hectare"
"            Time of concentration  3.642      0.672      2.228      minutes"
"            Time to Centroid       87.477     81.532     84.648     minutes"
```

```
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        27.86      22.80      50.66      c.m"
"             Rainfall losses        10.285     5.234      8.012      mm"
"             Runoff depth           46.005     51.056     48.278     mm"
"             Runoff volume          22.77      20.68      43.45      c.m"
"             Runoff coefficient     0.817      0.907      0.858      "
"             Maximum flow           0.018      0.016      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.032     0.032     0.394     0.394"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.032     0.032     0.032     0.394"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.408    c.m/sec"
"             Hydrograph volume          1132.931    c.m"
"                     0.032     0.032     0.032     0.408"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.032     0.000     0.032     0.408"
" 33          CATCHMENT 305"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          305   External Drainage from 206"
"        0.000   % Impervious"
"        0.020   Total Area"
"       20.000   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"       20.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.007     0.000     0.032     0.408 c.m/sec"
"             Catchment 305          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  5.063      0.934      5.063      minutes"
"             Time to Centroid       89.284     81.728     89.284     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        11.26      0.00       11.26      c.m"
"             Rainfall losses        9.459      3.605      9.459      mm"
"             Runoff depth           46.831     52.685     46.831     mm"
"             Runoff volume          9.37       0.00       9.37       c.m"
"             Runoff coefficient     0.832      0.000      0.832      "
"             Maximum flow           0.007      0.000      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.007     0.007     0.032     0.408"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          206   Uncontrolled Sheet Flow"
"        0.000   % Impervious"
"        0.130   Total Area"
"       10.000   Flow length"
"        3.000   Overland Slope"
"        0.130   Pervious Area"
"       10.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.048     0.007     0.032     0.408 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  4.483      0.827      4.483      minutes"
"             Time to Centroid       88.521     81.569     88.521     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        73.18      0.00       73.18      c.m"
"             Rainfall losses        9.658      4.147      9.658      mm"
"             Runoff depth           46.632     52.143     46.632     mm"
"             Runoff volume          60.62      0.00       60.62      c.m"
"             Runoff coefficient     0.828      0.000      0.828      "
"             Maximum flow           0.048      0.000      0.048      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.048     0.055     0.032     0.408"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.048     0.055     0.055     0.408"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.447    c.m/sec"
"             Hydrograph volume          1202.920    c.m"
"                     0.048     0.055     0.055     0.447"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.048     0.000     0.055     0.447"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Site Development Area, Uncontrolled"
"       60.000   % Impervious"
"        0.260   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.104   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.100     0.000     0.055     0.447 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.104      0.156      0.260      hectare"
"             Time of concentration  2.049      0.378      1.033      minutes"
"             Time to Centroid       85.140     81.253     82.777     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        58.54      87.81      146.35     c.m"
"             Rainfall losses        9.790      8.233      8.856      mm"
"             Runoff depth           46.500     48.058     47.434     mm"
```

```
"             Runoff volume          48.36      74.97      123.33     c.m"
"             Runoff coefficient     0.826      0.854      0.843      "
"             Maximum flow           0.039      0.062      0.100      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.100     0.100     0.055     0.447"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.100     0.100     0.100     0.447"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.516    c.m/sec"
"             Hydrograph volume         1326.249    c.m"
"                    0.100     0.100     0.100     0.516"
" 40          HYDROGRAPH   Confluence    1001"
"            7   Confluence "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.516    c.m/sec"
"             Hydrograph volume         1326.249    c.m"
"                    0.100     0.516     0.100     0.000"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              \\gamsby.local\gmprojects\Kitchener\"
"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Post"
"                Output filename:                                  25mm_Post8.out"
"                Licensee name:                                            GMBP"
"                Company                                                      "
"                Date & Time last used:                 3/4/2021 at 12:52:40 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      509.000   Coefficient A"
"        6.000   Constant B"
"        0.799   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity            73.899    mm/hr"
"             Total depth                  23.469    mm"
"            7   0025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   External Drainage to 201"
"       41.000   % Impervious"
"        0.370   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.218   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.152   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.038     0.000     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.218      0.152      0.370      hectare"
"             Time of concentration  5.995      1.019      3.468      minutes"
"             Time to Centroid       95.375     85.205     90.211     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        51.23      35.60      86.84      c.m"
"             Rainfall losses        9.148      2.212      6.305      mm"
"             Runoff depth           14.321     21.257     17.165     mm"
"             Runoff volume          31.26      32.25      63.51      c.m"
"             Runoff coefficient     0.610      0.906      0.731      "
"             Maximum flow           0.022      0.026      0.038      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.038     0.038     0.000     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Site Drainage to CB4"
"       65.000   % Impervious"
"        0.240   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.084   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.034     0.038     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.084      0.156      0.240      hectare"
"             Time of concentration  3.082      0.524      1.229      minutes"
"             Time to Centroid       91.456     85.341     87.027     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        19.71      36.61      56.33      c.m"
"             Rainfall losses        9.366      3.512      5.561      mm"
"             Runoff depth           14.103     19.957     17.908     mm"
```

```
"             Runoff volume          11.85      31.13      42.98      c.m"
"             Runoff coefficient     0.601      0.850      0.763      "
"             Maximum flow           0.010      0.028      0.034      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.034     0.069     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.034     0.069     0.069     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.069    c.m/sec"
"             Hydrograph volume           106.488    c.m"
"                     0.034     0.069     0.069     0.069"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.034     0.000     0.069     0.069"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          301   External Drainage to 203"
"        0.000   % Impervious"
"        0.010   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.010   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.001     0.000     0.069     0.069 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.010      0.000      0.010      hectare"
"             Time of concentration  7.891      1.342      7.891      minutes"
"             Time to Centroid       97.932     85.788     97.932     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
```

```
"             Rainfall volume        2.35       0.00       2.35       c.m"
"             Rainfall losses        9.129      1.924      9.129      mm"
"             Runoff depth           14.340     21.545     14.340     mm"
"             Runoff volume          1.43       0.00       1.43       c.m"
"             Runoff coefficient     0.611      0.000      0.611      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.001     0.069     0.069"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   North Swale"
"       50.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.035   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.035   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.009     0.001     0.069     0.069 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.035      0.035      0.070      hectare"
"             Time of concentration  3.082      0.524      1.583      minutes"
"             Time to Centroid       91.456     85.341     87.873     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        8.21       8.21       16.43      c.m"
"             Rainfall losses        9.366      3.512      6.439      mm"
"             Runoff depth           14.103     19.957     17.030     mm"
"             Runoff volume          4.94       6.98       11.92      c.m"
"             Runoff coefficient     0.601      0.850      0.726      "
"             Maximum flow           0.004      0.006      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.009     0.069     0.069"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                    0.009     0.009     0.009     0.069"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.078    c.m/sec"
"             Hydrograph volume           119.843    c.m"
"                    0.009     0.009     0.009     0.078"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.009     0.000     0.009     0.078"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          302   External Drainage to 204"
"        0.000   % Impervious"
"        0.250   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.250   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.024     0.000     0.009     0.078 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.250      0.000      0.250      hectare"
"             Time of concentration  7.891      1.342      7.891      minutes"
"             Time to Centroid       97.932     85.788     97.932     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        58.67      0.00       58.67      c.m"
"             Rainfall losses        9.129      1.924      9.129      mm"
"             Runoff depth           14.340     21.545     14.340     mm"
"             Runoff volume          35.85      0.00       35.85      c.m"
"             Runoff coefficient     0.611      0.000      0.611      "
"             Maximum flow           0.024      0.000      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.024     0.024     0.009     0.078"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          204   Site Drainage to DCB2"
"       45.000   % Impervious"
"        0.090   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.050   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.041   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.011     0.024     0.009     0.078 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.041      0.090      hectare"
"             Time of concentration  3.082      0.524      1.710      minutes"
"             Time to Centroid       91.456     85.341     88.175     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        11.62      9.51       21.12      c.m"
"             Rainfall losses        9.366      3.512      6.732      mm"
"             Runoff depth           14.103     19.957     16.737     mm"
"             Runoff volume          6.98       8.08       15.06      c.m"
"             Runoff coefficient     0.601      0.850      0.713      "
"             Maximum flow           0.006      0.007      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.011     0.033     0.009     0.078"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.011     0.033     0.033     0.078"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.102    c.m/sec"
```

```
"             Hydrograph volume           170.757    c.m"
"                    0.011     0.033     0.033     0.102"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.011     0.000     0.033     0.102"
" 33          CATCHMENT 303"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          303   External Drainage to 205"
"        0.000   % Impervious"
"        0.030   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.030   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.003     0.000     0.033     0.102 c.m/sec"
"             Catchment 303          Pervious   Impervious Total Area "
"             Surface Area           0.030      0.000      0.030      hectare"
"             Time of concentration  7.380      1.255      7.380      minutes"
"             Time to Centroid       97.262     85.661     97.262     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        7.04       0.00       7.04       c.m"
"             Rainfall losses        9.124      1.980      9.124      mm"
"             Runoff depth           14.345     21.489     14.345     mm"
"             Runoff volume          4.30       0.00       4.30       c.m"
"             Runoff coefficient     0.611      0.000      0.611      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.003     0.003     0.033     0.102"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          205   Site Drainage to Swale"
```

```
"       50.000   % Impervious"
"        0.040   Total Area"
"        8.000   Flow length"
"       15.000   Overland Slope"
"        0.020   Pervious Area"
"        8.000   Pervious length"
"       15.000   Pervious slope"
"        0.020   Impervious Area"
"        8.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.005     0.003     0.033     0.102 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.020      0.040      hectare"
"             Time of concentration  3.640      0.619      1.851      minutes"
"             Time to Centroid       92.356     85.295     88.173     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        4.69       4.69       9.39       c.m"
"             Rainfall losses        9.430      3.069      6.249      mm"
"             Runoff depth           14.039     20.400     17.220     mm"
"             Runoff volume          2.81       4.08       6.89       c.m"
"             Runoff coefficient     0.598      0.869      0.734      "
"             Maximum flow           0.002      0.004      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.005     0.007     0.033     0.102"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.005     0.007     0.007     0.102"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.109    c.m/sec"
"             Hydrograph volume           181.949    c.m"
"                    0.005     0.007     0.007     0.109"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.109    c.m/sec"
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"             Hydrograph volume           181.949    c.m"
"                     0.005     0.109     0.007     0.000"
" 33          CATCHMENT 306"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          306   External Drainage to 200"
"        7.000   % Impervious"
"        0.070   Total Area"
"       30.000   Flow length"
"        7.000   Overland Slope"
"        0.065   Pervious Area"
"       30.000   Pervious length"
"        7.000   Pervious slope"
"        0.005   Impervious Area"
"       30.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.006     0.109     0.007     0.000 c.m/sec"
"             Catchment 306          Pervious   Impervious Total Area "
"             Surface Area           0.065      0.005      0.070      hectare"
"             Time of concentration  10.112     1.719      9.255      minutes"
"             Time to Centroid       100.877    86.247     99.384     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        15.28      1.15       16.43      c.m"
"             Rainfall losses        9.145      1.830      8.633      mm"
"             Runoff depth           14.324     21.639     14.836     mm"
"             Runoff volume          9.32       1.06       10.39      c.m"
"             Runoff coefficient     0.610      0.922      0.632      "
"             Maximum flow           0.005      0.001      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.006     0.114     0.007     0.000"
" 33          CATCHMENT 307"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          307   External Drainage to 200"
"       21.000   % Impervious"
"        0.180   Total Area"
"       10.000   Flow length"
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"        4.000   Overland Slope"
"        0.142   Pervious Area"
"       10.000   Pervious length"
"        4.000   Pervious slope"
"        0.038   Impervious Area"
"       10.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.018     0.114     0.007     0.000 c.m/sec"
"             Catchment 307          Pervious   Impervious Total Area "
"             Surface Area           0.142      0.038      0.180      hectare"
"             Time of concentration  6.187      1.052      4.732      minutes"
"             Time to Centroid       95.666     85.268     92.719     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        33.37      8.87       42.24      c.m"
"             Rainfall losses        9.150      2.170      7.684      mm"
"             Runoff depth           14.319     21.299     15.785     mm"
"             Runoff volume          20.36      8.05       28.41      c.m"
"             Runoff coefficient     0.610      0.908      0.673      "
"             Maximum flow           0.014      0.007      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.018     0.133     0.007     0.000"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Site Development"
"       70.000   % Impervious"
"        0.900   Total Area"
"       10.000   Flow length"
"        5.000   Overland Slope"
"        0.270   Pervious Area"
"       10.000   Pervious length"
"        5.000   Pervious slope"
"        0.630   Impervious Area"
"       10.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
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"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.121     0.133     0.007     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.270      0.630      0.900      hectare"
"             Time of concentration  5.786      0.984      2.062      minutes"
"             Time to Centroid       95.074     85.144     87.374     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        63.37      147.86     211.22     c.m"
"             Rainfall losses        9.137      2.262      4.325      mm"
"             Runoff depth           14.332     21.207     19.145     mm"
"             Runoff volume          38.70      133.60     172.30     c.m"
"             Runoff coefficient     0.611      0.904      0.816      "
"             Maximum flow           0.028      0.110      0.121      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.121     0.236     0.007     0.000"
" 54          POND DESIGN"
"        0.236   Current peak flow    c.m/sec"
"        0.129   Target outflow    c.m/sec"
"        393.0   Hydrograph volume    c.m"
"          23.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                348.710     0.000     0.000"
"                348.810   0.02640    0.6000"
"                348.910   0.03730     1.200"
"                349.010   0.04570     2.450"
"                349.110   0.05280     4.170"
"                349.210   0.05900     6.000"
"                349.310   0.06470     7.910"
"                349.410   0.06990     8.660"
"                349.440   0.07130     9.030"
"                349.510    0.1865    48.060"
"                349.610    0.2535   103.470"
"                349.710    0.3031   158.990"
"                349.810    0.3447   214.590"
"                349.910    0.3812   270.130"
"                350.010    0.4143   325.130"
"                350.060    0.4298   352.880"
"                350.080    0.4359   353.230"
"                350.110    0.4448   371.700"
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"               350.140    0.4535   399.470"
"               350.170    0.4620   436.720"
"               350.200    0.4704   477.160"
"               350.220    0.5143   477.510"
"               350.320    0.9381   478.520"
"            Peak outflow                  0.188    c.m/sec"
"            Maximum level               349.514    metre"
"            Maximum storage              50.541    c.m"
"            Centroidal lag                1.539   hours"
"                 0.121     0.236     0.188     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    1001"
"           6   Combine "
"        1001   Node #"
"               Total Site Runoff"
"            Maximum flow                  0.188    c.m/sec"
"            Hydrograph volume           392.828    c.m"
"                    0.121     0.236     0.188     0.188"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.121     0.000     0.188     0.188"
" 33         CATCHMENT 304"
"           1   Triangular SCS"
"           1   Equal length"
"           2   Horton equation"
"         304   External Drainage to House 1016"
"      45.000   % Impervious"
"       0.090   Total Area"
"      10.000   Flow length"
"       6.000   Overland Slope"
"       0.050   Pervious Area"
"      10.000   Pervious length"
"       6.000   Pervious slope"
"       0.041   Impervious Area"
"      10.000   Impervious length"
"       6.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"       6.000   Pervious Max.infiltration"
"       1.000   Pervious Min.infiltration"
"       0.250   Pervious Lag constant (hours)"
"       5.000   Pervious Depression storage"
"       0.015   Impervious Manning 'n'"
"       0.000   Impervious Max.infiltration"
"       0.000   Impervious Min.infiltration"
"       0.050   Impervious Lag constant (hours)"
"       1.500   Impervious Depression storage"
"                    0.009     0.000     0.188     0.188 c.m/sec"
"            Catchment 304          Pervious   Impervious Total Area "
"            Surface Area           0.050      0.041      0.090      hectare"
"            Time of concentration  5.478      0.931      2.992      minutes"
"            Time to Centroid       94.642     85.066     89.405     minutes"
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"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        11.62      9.51       21.12      c.m"
"             Rainfall losses        9.147      2.340      6.084      mm"
"             Runoff depth           14.322     21.129     17.386     mm"
"             Runoff volume          7.09       8.56       15.65      c.m"
"             Runoff coefficient     0.610      0.900      0.741      "
"             Maximum flow           0.005      0.007      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.009     0.188     0.188"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.009     0.009     0.009     0.188"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.194    c.m/sec"
"             Hydrograph volume           408.475    c.m"
"                     0.009     0.009     0.009     0.194"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.009     0.000     0.009     0.194"
" 33          CATCHMENT 305"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          305   External Drainage from 206"
"        0.000   % Impervious"
"        0.020   Total Area"
"       20.000   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"       20.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.002     0.000     0.009     0.194 c.m/sec"
"             Catchment 305          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  7.617      1.295      7.617      minutes"
"             Time to Centroid       97.572     85.728     97.572     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        4.69       0.00       4.69       c.m"
"             Rainfall losses        9.117      1.953      9.117      mm"
"             Runoff depth           14.353     21.516     14.353     mm"
"             Runoff volume          2.87       0.00       2.87       c.m"
"             Runoff coefficient     0.612      0.000      0.612      "
"             Maximum flow           0.002      0.000      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.002     0.002     0.009     0.194"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          206   Uncontrolled Sheet Flow"
"        0.000   % Impervious"
"        0.130   Total Area"
"       10.000   Flow length"
"        3.000   Overland Slope"
"        0.130   Pervious Area"
"       10.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.013     0.002     0.009     0.194 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  6.745      1.147      6.745      minutes"
"             Time to Centroid       96.454     85.461     96.454     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        30.51      0.00       30.51      c.m"
"             Rainfall losses        9.214      2.069      9.214      mm"
"             Runoff depth           14.256     21.400     14.256     mm"
"             Runoff volume          18.53      0.00       18.53      c.m"
"             Runoff coefficient     0.607      0.000      0.607      "
"             Maximum flow           0.013      0.000      0.013      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.013     0.015     0.009     0.194"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.013     0.015     0.015     0.194"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.208    c.m/sec"
"             Hydrograph volume           429.878    c.m"
"                     0.013     0.015     0.015     0.208"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.013     0.000     0.015     0.208"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Site Development Area, Uncontrolled"
"       60.000   % Impervious"
"        0.260   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.104   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.036     0.000     0.015     0.208 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.104      0.156      0.260      hectare"
"             Time of concentration  3.082      0.524      1.343      minutes"
"             Time to Centroid       91.456     85.341     87.300     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        24.41      36.61      61.02      c.m"
"             Rainfall losses        9.366      3.512      5.854      mm"
"             Runoff depth           14.103     19.957     17.615     mm"
```

```
"             Runoff volume          14.67      31.13      45.80      c.m"
"             Runoff coefficient     0.601      0.850      0.751      "
"             Maximum flow           0.012      0.028      0.036      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.036     0.036     0.015     0.208"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.036     0.036     0.036     0.208"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.233    c.m/sec"
"             Hydrograph volume          475.677    c.m"
"                    0.036     0.036     0.036     0.233"
" 40          HYDROGRAPH   Confluence    1001"
"            7   Confluence "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.233    c.m/sec"
"             Hydrograph volume          475.677    c.m"
"                    0.036     0.233     0.036     0.000"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              \\gamsby.local\gmprojects\Kitchener\"
"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Post"
"                Output filename:                                  25yr_Post1.out"
"                Licensee name:                                             GMBP"
"                Company                                                       "
"                Date & Time last used:                 3/4/2021 at 2:15:57 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3158.000   Coefficient A"
"       15.000   Constant B"
"        0.936   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          189.355    mm/hr"
"             Total depth                 68.266    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   External Drainage to 201"
"       41.000   % Impervious"
"        0.370   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.218   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.152   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.150     0.000     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.218      0.152      0.370      hectare"
"             Time of concentration  3.792      0.700      2.468      minutes"
"             Time to Centroid       87.185     81.232     84.636     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        149.03     103.56     252.59     c.m"
"             Rainfall losses        10.317     5.834      8.479      mm"
"             Runoff depth           57.950     62.432     59.787     mm"
"             Runoff volume          126.50     94.71      221.21     c.m"
"             Runoff coefficient     0.849      0.915      0.876      "
"             Maximum flow           0.093      0.069      0.150      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.150     0.150     0.000     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Site Drainage to CB4"
"       65.000   % Impervious"
"        0.240   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.084   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.105     0.150     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.084      0.156      0.240      hectare"
"             Time of concentration  1.950      0.360      0.916      minutes"
"             Time to Centroid       84.581     80.836     82.147     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        57.34      106.50     163.84     c.m"
"             Rainfall losses        10.050     10.065     10.059     mm"
"             Runoff depth           58.217     58.202     58.207     mm"
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"             Runoff volume          48.90      90.79      139.70     c.m"
"             Runoff coefficient     0.853      0.853      0.853      "
"             Maximum flow           0.036      0.069      0.105      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.105     0.255     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.105     0.255     0.255     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.255    c.m/sec"
"             Hydrograph volume           360.910    c.m"
"                    0.105     0.255     0.255     0.255"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.105     0.000     0.255     0.255"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          301   External Drainage to 203"
"        0.000   % Impervious"
"        0.010   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.010   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.004     0.000     0.255     0.255 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.010      0.000      0.010      hectare"
"             Time of concentration  4.992      0.921      4.992      minutes"
"             Time to Centroid       88.711     81.410     88.711     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
```

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"             Rainfall volume        6.83       0.00       6.83       c.m"
"             Rainfall losses        9.610      4.113      9.610      mm"
"             Runoff depth           58.656     64.153     58.656     mm"
"             Runoff volume          5.87       0.00       5.87       c.m"
"             Runoff coefficient     0.859      0.000      0.859      "
"             Maximum flow           0.004      0.000      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.004     0.004     0.255     0.255"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   North Swale"
"       50.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.035   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.035   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.031     0.004     0.255     0.255 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.035      0.035      0.070      hectare"
"             Time of concentration  1.950      0.360      1.155      minutes"
"             Time to Centroid       84.581     80.836     82.709     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        23.89      23.89      47.79      c.m"
"             Rainfall losses        10.050     10.065     10.057     mm"
"             Runoff depth           58.217     58.202     58.209     mm"
"             Runoff volume          20.38      20.37      40.75      c.m"
"             Runoff coefficient     0.853      0.853      0.853      "
"             Maximum flow           0.015      0.016      0.031      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.031     0.034     0.255     0.255"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.031     0.034     0.034     0.255"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.289    c.m/sec"
"             Hydrograph volume           407.522    c.m"
"                     0.031     0.034     0.034     0.289"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.031     0.000     0.034     0.289"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          302   External Drainage to 204"
"        0.000   % Impervious"
"        0.250   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.250   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.108     0.000     0.034     0.289 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.250      0.000      0.250      hectare"
"             Time of concentration  4.992      0.921      4.992      minutes"
"             Time to Centroid       88.711     81.410     88.711     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        170.67     0.00       170.67     c.m"
"             Rainfall losses        9.610      4.113      9.610      mm"
"             Runoff depth           58.656     64.153     58.656     mm"
"             Runoff volume          146.64     0.00       146.64     c.m"
"             Runoff coefficient     0.859      0.000      0.859      "
"             Maximum flow           0.108      0.000      0.108      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.108     0.108     0.034     0.289"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          204   Site Drainage to DCB2"
"       45.000   % Impervious"
"        0.090   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.050   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.041   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.039     0.108     0.034     0.289 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.041      0.090      hectare"
"             Time of concentration  1.950      0.360      1.234      minutes"
"             Time to Centroid       84.581     80.836     82.896     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        33.79      27.65      61.44      c.m"
"             Rainfall losses        10.050     10.065     10.056     mm"
"             Runoff depth           58.217     58.202     58.210     mm"
"             Runoff volume          28.82      23.57      52.39      c.m"
"             Runoff coefficient     0.853      0.853      0.853      "
"             Maximum flow           0.021      0.018      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.039     0.138     0.034     0.289"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.039     0.138     0.138     0.289"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.407    c.m/sec"
```

```
"             Hydrograph volume           606.550    c.m"
"                    0.039     0.138     0.138     0.407"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.039     0.000     0.138     0.407"
" 33          CATCHMENT 303"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          303   External Drainage to 205"
"        0.000   % Impervious"
"        0.030   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.030   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.013     0.000     0.138     0.407 c.m/sec"
"             Catchment 303          Pervious   Impervious Total Area "
"             Surface Area           0.030      0.000      0.030      hectare"
"             Time of concentration  4.669      0.861      4.669      minutes"
"             Time to Centroid       88.274     81.326     88.274     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        20.48      0.00       20.48      c.m"
"             Rainfall losses        9.688      4.484      9.688      mm"
"             Runoff depth           58.579     63.782     58.579     mm"
"             Runoff volume          17.57      0.00       17.57      c.m"
"             Runoff coefficient     0.858      0.000      0.858      "
"             Maximum flow           0.013      0.000      0.013      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.013     0.013     0.138     0.407"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          205   Site Drainage to Swale"
```

```
"       50.000   % Impervious"
"        0.040   Total Area"
"        8.000   Flow length"
"       15.000   Overland Slope"
"        0.020   Pervious Area"
"        8.000   Pervious length"
"       15.000   Pervious slope"
"        0.020   Impervious Area"
"        8.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.017     0.013     0.138     0.407 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.020      0.040      hectare"
"             Time of concentration  2.303      0.425      1.357      minutes"
"             Time to Centroid       85.082     81.037     83.045     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        13.65      13.65      27.31      c.m"
"             Rainfall losses        10.233     9.385      9.809      mm"
"             Runoff depth           58.034     58.881     58.457     mm"
"             Runoff volume          11.61      11.78      23.38      c.m"
"             Runoff coefficient     0.850      0.863      0.856      "
"             Maximum flow           0.008      0.009      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.017     0.027     0.138     0.407"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.017     0.027     0.027     0.407"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.435    c.m/sec"
"             Hydrograph volume           647.507    c.m"
"                    0.017     0.027     0.027     0.435"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.435    c.m/sec"
```

```
"             Hydrograph volume           647.507    c.m"
"                     0.017     0.435     0.027     0.000"
" 33          CATCHMENT 306"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          306   External Drainage to 200"
"        7.000   % Impervious"
"        0.070   Total Area"
"       30.000   Flow length"
"        7.000   Overland Slope"
"        0.065   Pervious Area"
"       30.000   Pervious length"
"        7.000   Pervious slope"
"        0.005   Impervious Area"
"       30.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.029     0.435     0.027     0.000 c.m/sec"
"             Catchment 306          Pervious   Impervious Total Area "
"             Surface Area           0.065      0.005      0.070      hectare"
"             Time of concentration  6.397      1.180      5.993      minutes"
"             Time to Centroid       90.542     81.754     89.862     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        44.44      3.35       47.79      c.m"
"             Rainfall losses        9.727      3.008      9.257      mm"
"             Runoff depth           58.539     65.259     59.009     mm"
"             Runoff volume          38.11      3.20       41.31      c.m"
"             Runoff coefficient     0.858      0.956      0.864      "
"             Maximum flow           0.027      0.002      0.029      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.029     0.453     0.027     0.000"
" 33          CATCHMENT 307"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          307   External Drainage to 200"
"       21.000   % Impervious"
"        0.180   Total Area"
"       10.000   Flow length"
```

```
"        4.000   Overland Slope"
"        0.142   Pervious Area"
"       10.000   Pervious length"
"        4.000   Pervious slope"
"        0.038   Impervious Area"
"       10.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.072     0.453     0.027     0.000 c.m/sec"
"             Catchment 307          Pervious   Impervious Total Area "
"             Surface Area           0.142      0.038      0.180      hectare"
"             Time of concentration  3.914      0.722      3.204      minutes"
"             Time to Centroid       87.338     81.225     85.978     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        97.07      25.80      122.88     c.m"
"             Rainfall losses        10.106     5.616      9.163      mm"
"             Runoff depth           58.161     62.650     59.104     mm"
"             Runoff volume          82.70      23.68      106.39     c.m"
"             Runoff coefficient     0.852      0.918      0.866      "
"             Maximum flow           0.061      0.017      0.072      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.072     0.522     0.027     0.000"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Site Development"
"       70.000   % Impervious"
"        0.900   Total Area"
"       10.000   Flow length"
"        5.000   Overland Slope"
"        0.270   Pervious Area"
"       10.000   Pervious length"
"        5.000   Pervious slope"
"        0.630   Impervious Area"
"       10.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
```

```
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.389     0.522     0.027     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.270      0.630      0.900      hectare"
"             Time of concentration  3.661      0.675      1.525      minutes"
"             Time to Centroid       87.037     81.238     82.888     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        184.32     430.08     614.40     c.m"
"             Rainfall losses        10.561     6.084      7.427      mm"
"             Runoff depth           57.705     62.182     60.839     mm"
"             Runoff volume          155.80     391.75     547.55     c.m"
"             Runoff coefficient     0.845      0.911      0.891      "
"             Maximum flow           0.114      0.288      0.389      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.389     0.911     0.027     0.000"
" 54          POND DESIGN"
"        0.911   Current peak flow    c.m/sec"
"        0.129   Target outflow    c.m/sec"
"       1342.7   Hydrograph volume    c.m"
"          23.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                348.710     0.000     0.000"
"                348.810   0.02640    0.6000"
"                348.910   0.03730     1.200"
"                349.010   0.04570     2.450"
"                349.110   0.05280     4.170"
"                349.210   0.05900     6.000"
"                349.310   0.06470     7.910"
"                349.410   0.06990     8.660"
"                349.440   0.07130     9.030"
"                349.510    0.1865    48.060"
"                349.610    0.2535   103.470"
"                349.710    0.3031   158.990"
"                349.810    0.3447   214.590"
"                349.910    0.3812   270.130"
"                350.010    0.4143   325.130"
"                350.060    0.4298   352.880"
"                350.080    0.4359   353.230"
"                350.110    0.4448   371.700"
```

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"               350.140    0.4535   399.470"
"               350.170    0.4620   436.720"
"               350.200    0.4704   477.160"
"               350.220    0.5143   477.510"
"               350.320    0.9381   478.520"
"            Peak outflow                  0.446    c.m/sec"
"            Maximum level               350.115    metre"
"            Maximum storage             376.340    c.m"
"            Centroidal lag                1.553   hours"
"                 0.389     0.911     0.446     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    1001"
"           6   Combine "
"         1001   Node #"
"               Total Site Runoff"
"            Maximum flow                  0.446    c.m/sec"
"            Hydrograph volume          1344.633    c.m"
"                    0.389     0.911     0.446     0.446"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.389     0.000     0.446     0.446"
" 33         CATCHMENT 304"
"           1   Triangular SCS"
"           1   Equal length"
"           2   Horton equation"
"         304   External Drainage to House 1016"
"       45.000   % Impervious"
"        0.090   Total Area"
"       10.000   Flow length"
"        6.000   Overland Slope"
"        0.050   Pervious Area"
"       10.000   Pervious length"
"        6.000   Pervious slope"
"        0.041   Impervious Area"
"       10.000   Impervious length"
"        6.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.037     0.000     0.446     0.446 c.m/sec"
"            Catchment 304          Pervious   Impervious Total Area "
"            Surface Area           0.050      0.041      0.090      hectare"
"            Time of concentration  3.466      0.639      2.147      minutes"
"            Time to Centroid       86.762     81.243     84.187     minutes"
```

```
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        33.79      27.65      61.44      c.m"
"             Rainfall losses        10.495     6.493      8.694      mm"
"             Runoff depth           57.771     61.773     59.572     mm"
"             Runoff volume          28.60      25.02      53.61      c.m"
"             Runoff coefficient     0.846      0.905      0.873      "
"             Maximum flow           0.021      0.018      0.037      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.037     0.037     0.446     0.446"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.037     0.037     0.037     0.446"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.464    c.m/sec"
"             Hydrograph volume          1398.248    c.m"
"                     0.037     0.037     0.037     0.464"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.037     0.000     0.037     0.464"
" 33          CATCHMENT 305"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          305   External Drainage from 206"
"        0.000   % Impervious"
"        0.020   Total Area"
"       20.000   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"       20.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.009     0.000     0.037     0.464 c.m/sec"
"             Catchment 305          Pervious   Impervious Total Area "
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"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  4.819      0.889      4.819      minutes"
"             Time to Centroid       88.486     81.363     88.486     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        13.65      0.00       13.65      c.m"
"             Rainfall losses        9.687      4.304      9.687      mm"
"             Runoff depth           58.579     63.962     58.579     mm"
"             Runoff volume          11.72      0.00       11.72      c.m"
"             Runoff coefficient     0.858      0.000      0.858      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.009     0.037     0.464"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          206   Uncontrolled Sheet Flow"
"        0.000   % Impervious"
"        0.130   Total Area"
"       10.000   Flow length"
"        3.000   Overland Slope"
"        0.130   Pervious Area"
"       10.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.056     0.009     0.037     0.464 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  4.267      0.787      4.267      minutes"
"             Time to Centroid       87.770     81.248     87.770     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        88.75      0.00       88.75      c.m"
"             Rainfall losses        9.804      5.038      9.804      mm"
"             Runoff depth           58.463     63.228     58.463     mm"
"             Runoff volume          76.00      0.00       76.00      c.m"
"             Runoff coefficient     0.856      0.000      0.856      "
"             Maximum flow           0.056      0.000      0.056      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.056     0.065     0.037     0.464"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.056     0.065     0.065     0.464"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.505    c.m/sec"
"             Hydrograph volume          1485.965    c.m"
"                     0.056     0.065     0.065     0.505"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.056     0.000     0.065     0.505"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Site Development Area, Uncontrolled"
"       60.000   % Impervious"
"        0.260   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.104   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.114     0.000     0.065     0.505 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.104      0.156      0.260      hectare"
"             Time of concentration  1.950      0.360      0.996      minutes"
"             Time to Centroid       84.581     80.836     82.334     minutes"
"             Rainfall depth         68.266     68.266     68.266     mm"
"             Rainfall volume        71.00      106.50     177.49     c.m"
"             Rainfall losses        10.050     10.065     10.059     mm"
"             Runoff depth           58.217     58.202     58.208     mm"
```

```
"             Runoff volume          60.55      90.79      151.34     c.m"
"             Runoff coefficient     0.853      0.853      0.853      "
"             Maximum flow           0.044      0.069      0.114      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.114     0.114     0.065     0.505"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.114     0.114     0.114     0.505"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.587    c.m/sec"
"             Hydrograph volume         1637.305    c.m"
"                    0.114     0.114     0.114     0.587"
" 40          HYDROGRAPH   Confluence    1001"
"            7   Confluence "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.587    c.m/sec"
"             Hydrograph volume         1637.305    c.m"
"                    0.114     0.587     0.114     0.000"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              \\gamsby.local\gmprojects\Kitchener\"
"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Post"
"                Output filename:                                  50yr_Post1.out"
"                Licensee name:                                             GMBP"
"                Company                                                       "
"                Date & Time last used:                 3/4/2021 at 2:17:27 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3886.000   Coefficient A"
"       16.000   Constant B"
"        0.950   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           213.371    mm/hr"
"             Total depth                  77.647    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   External Drainage to 201"
"       41.000   % Impervious"
"        0.370   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.218   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.152   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.172     0.000     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.218      0.152      0.370      hectare"
"             Time of concentration  3.615      0.667      2.365      minutes"
"             Time to Centroid       86.530     80.932     84.157     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        169.50     117.79     287.30     c.m"
"             Rainfall losses        10.786     6.876      9.183      mm"
"             Runoff depth           66.862     70.771     68.465     mm"
"             Runoff volume          145.96     107.36     253.32     c.m"
"             Runoff coefficient     0.861      0.911      0.882      "
"             Maximum flow           0.104      0.078      0.172      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.172     0.172     0.000     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Site Drainage to CB4"
"       65.000   % Impervious"
"        0.240   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.084   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.119     0.172     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.084      0.156      0.240      hectare"
"             Time of concentration  1.858      0.343      0.880      minutes"
"             Time to Centroid       84.020     80.452     81.717     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        65.22      121.13     186.35     c.m"
"             Rainfall losses        10.118     11.478     11.002     mm"
"             Runoff depth           67.530     66.169     66.645     mm"
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"             Runoff volume          56.72      103.22     159.95     c.m"
"             Runoff coefficient     0.870      0.852      0.858      "
"             Maximum flow           0.041      0.079      0.119      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.119     0.291     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.119     0.291     0.291     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.291    c.m/sec"
"             Hydrograph volume           413.268    c.m"
"                     0.119     0.291     0.291     0.291"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.119     0.000     0.291     0.291"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          301   External Drainage to 203"
"        0.000   % Impervious"
"        0.010   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.010   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.005     0.000     0.291     0.291 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.010      0.000      0.010      hectare"
"             Time of concentration  4.758      0.878      4.758      minutes"
"             Time to Centroid       87.935     81.080     87.935     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
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"             Rainfall volume        7.76       0.00       7.76       c.m"
"             Rainfall losses        9.754      4.799      9.754      mm"
"             Runoff depth           67.894     72.849     67.894     mm"
"             Runoff volume          6.79       0.00       6.79       c.m"
"             Runoff coefficient     0.874      0.000      0.874      "
"             Maximum flow           0.005      0.000      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.005     0.005     0.291     0.291"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   North Swale"
"       50.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.035   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.035   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.035     0.005     0.291     0.291 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.035      0.035      0.070      hectare"
"             Time of concentration  1.858      0.343      1.108      minutes"
"             Time to Centroid       84.020     80.452     82.254     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        27.18      27.18      54.35      c.m"
"             Rainfall losses        10.118     11.478     10.798     mm"
"             Runoff depth           67.530     66.169     66.849     mm"
"             Runoff volume          23.64      23.16      46.79      c.m"
"             Runoff coefficient     0.870      0.852      0.861      "
"             Maximum flow           0.017      0.018      0.035      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.035     0.038     0.291     0.291"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.035     0.038     0.038     0.291"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.330    c.m/sec"
"             Hydrograph volume           466.852    c.m"
"                     0.035     0.038     0.038     0.330"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.035     0.000     0.038     0.330"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          302   External Drainage to 204"
"        0.000   % Impervious"
"        0.250   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.250   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.123     0.000     0.038     0.330 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.250      0.000      0.250      hectare"
"             Time of concentration  4.758      0.878      4.758      minutes"
"             Time to Centroid       87.935     81.080     87.935     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        194.12     0.00       194.12     c.m"
"             Rainfall losses        9.754      4.799      9.754      mm"
"             Runoff depth           67.894     72.849     67.894     mm"
"             Runoff volume          169.73     0.00       169.73     c.m"
"             Runoff coefficient     0.874      0.000      0.874      "
"             Maximum flow           0.123      0.000      0.123      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.123     0.123     0.038     0.330"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          204   Site Drainage to DCB2"
"       45.000   % Impervious"
"        0.090   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.050   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.041   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.045     0.123     0.038     0.330 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.041      0.090      hectare"
"             Time of concentration  1.858      0.343      1.184      minutes"
"             Time to Centroid       84.020     80.452     82.432     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        38.44      31.45      69.88      c.m"
"             Rainfall losses        10.118     11.478     10.730     mm"
"             Runoff depth           67.530     66.169     66.917     mm"
"             Runoff volume          33.43      26.80      60.23      c.m"
"             Runoff coefficient     0.870      0.852      0.862      "
"             Maximum flow           0.024      0.020      0.045      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.045     0.157     0.038     0.330"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.045     0.157     0.157     0.330"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.468    c.m/sec"
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"             Hydrograph volume           696.812    c.m"
"                    0.045     0.157     0.157     0.468"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.045     0.000     0.157     0.468"
" 33          CATCHMENT 303"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          303   External Drainage to 205"
"        0.000   % Impervious"
"        0.030   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.030   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.015     0.000     0.157     0.468 c.m/sec"
"             Catchment 303          Pervious   Impervious Total Area "
"             Surface Area           0.030      0.000      0.030      hectare"
"             Time of concentration  4.450      0.821      4.450      minutes"
"             Time to Centroid       87.558     81.012     87.558     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        23.29      0.00       23.29      c.m"
"             Rainfall losses        9.832      5.264      9.832      mm"
"             Runoff depth           67.816     72.383     67.816     mm"
"             Runoff volume          20.34      0.00       20.34      c.m"
"             Runoff coefficient     0.873      0.000      0.873      "
"             Maximum flow           0.015      0.000      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.015     0.015     0.157     0.468"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          205   Site Drainage to Swale"
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"       50.000   % Impervious"
"        0.040   Total Area"
"        8.000   Flow length"
"       15.000   Overland Slope"
"        0.020   Pervious Area"
"        8.000   Pervious length"
"       15.000   Pervious slope"
"        0.020   Impervious Area"
"        8.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.020     0.015     0.157     0.468 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.020      0.040      hectare"
"             Time of concentration  2.195      0.405      1.304      minutes"
"             Time to Centroid       84.483     80.672     82.585     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        15.53      15.53      31.06      c.m"
"             Rainfall losses        10.247     10.779     10.513     mm"
"             Runoff depth           67.401     66.868     67.134     mm"
"             Runoff volume          13.48      13.37      26.85      c.m"
"             Runoff coefficient     0.868      0.861      0.865      "
"             Maximum flow           0.010      0.010      0.020      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.020     0.031     0.157     0.468"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.020     0.031     0.031     0.468"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.500    c.m/sec"
"             Hydrograph volume           744.010    c.m"
"                    0.020     0.031     0.031     0.500"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.500    c.m/sec"
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"             Hydrograph volume           744.010    c.m"
"                     0.020     0.500     0.031     0.000"
" 33          CATCHMENT 306"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          306   External Drainage to 200"
"        7.000   % Impervious"
"        0.070   Total Area"
"       30.000   Flow length"
"        7.000   Overland Slope"
"        0.065   Pervious Area"
"       30.000   Pervious length"
"        7.000   Pervious slope"
"        0.005   Impervious Area"
"       30.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.033     0.500     0.031     0.000 c.m/sec"
"             Catchment 306          Pervious   Impervious Total Area "
"             Surface Area           0.065      0.005      0.070      hectare"
"             Time of concentration  6.097      1.125      5.720      minutes"
"             Time to Centroid       89.664     81.403     89.037     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        50.55      3.80       54.35      c.m"
"             Rainfall losses        9.642      3.405      9.205      mm"
"             Runoff depth           68.006     74.242     68.442     mm"
"             Runoff volume          44.27      3.64       47.91      c.m"
"             Runoff coefficient     0.876      0.956      0.881      "
"             Maximum flow           0.031      0.003      0.033      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.033     0.522     0.031     0.000"
" 33          CATCHMENT 307"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          307   External Drainage to 200"
"       21.000   % Impervious"
"        0.180   Total Area"
"       10.000   Flow length"
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"        4.000   Overland Slope"
"        0.142   Pervious Area"
"       10.000   Pervious length"
"        4.000   Pervious slope"
"        0.038   Impervious Area"
"       10.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.080     0.522     0.031     0.000 c.m/sec"
"             Catchment 307          Pervious   Impervious Total Area "
"             Surface Area           0.142      0.038      0.180      hectare"
"             Time of concentration  3.731      0.688      3.062      minutes"
"             Time to Centroid       86.661     80.928     85.401     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        110.41     29.35      139.77     c.m"
"             Rainfall losses        10.622     6.614      9.780      mm"
"             Runoff depth           67.025     71.033     67.867     mm"
"             Runoff volume          95.31      26.85      122.16     c.m"
"             Runoff coefficient     0.863      0.915      0.874      "
"             Maximum flow           0.068      0.019      0.080      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.080     0.602     0.031     0.000"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Site Development"
"       70.000   % Impervious"
"        0.900   Total Area"
"       10.000   Flow length"
"        5.000   Overland Slope"
"        0.270   Pervious Area"
"       10.000   Pervious length"
"        5.000   Pervious slope"
"        0.630   Impervious Area"
"       10.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
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"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.441     0.602     0.031     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.270      0.630      0.900      hectare"
"             Time of concentration  3.489      0.644      1.467      minutes"
"             Time to Centroid       86.351     80.933     82.501     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        209.65     489.18     698.83     c.m"
"             Rainfall losses        10.689     7.181      8.234      mm"
"             Runoff depth           66.958     70.466     69.414     mm"
"             Runoff volume          180.79     443.94     624.72     c.m"
"             Runoff coefficient     0.862      0.908      0.894      "
"             Maximum flow           0.128      0.324      0.441      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.441     1.043     0.031     0.000"
" 54          POND DESIGN"
"        1.043   Current peak flow    c.m/sec"
"        0.129   Target outflow    c.m/sec"
"       1538.8   Hydrograph volume    c.m"
"          23.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                348.710     0.000     0.000"
"                348.810   0.02640    0.6000"
"                348.910   0.03730     1.200"
"                349.010   0.04570     2.450"
"                349.110   0.05280     4.170"
"                349.210   0.05900     6.000"
"                349.310   0.06470     7.910"
"                349.410   0.06990     8.660"
"                349.440   0.07130     9.030"
"                349.510    0.1865    48.060"
"                349.610    0.2535   103.470"
"                349.710    0.3031   158.990"
"                349.810    0.3447   214.590"
"                349.910    0.3812   270.130"
"                350.010    0.4143   325.130"
"                350.060    0.4298   352.880"
"                350.080    0.4359   353.230"
"                350.110    0.4448   371.700"
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"               350.140    0.4535   399.470"
"               350.170    0.4620   436.720"
"               350.200    0.4704   477.160"
"               350.220    0.5143   477.510"
"               350.320    0.9381   478.520"
"            Peak outflow                  0.466    c.m/sec"
"            Maximum level               350.187    metre"
"            Maximum storage             459.820    c.m"
"            Centroidal lag                1.567   hours"
"                 0.441     1.043     0.466     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    1001"
"           6   Combine "
"         1001   Node #"
"               Total Site Runoff"
"            Maximum flow                  0.466    c.m/sec"
"            Hydrograph volume          1538.842    c.m"
"                    0.441     1.043     0.466     0.466"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.441     0.000     0.466     0.466"
" 33         CATCHMENT 304"
"           1   Triangular SCS"
"           1   Equal length"
"           2   Horton equation"
"          304   External Drainage to House 1016"
"       45.000   % Impervious"
"        0.090   Total Area"
"       10.000   Flow length"
"        6.000   Overland Slope"
"        0.050   Pervious Area"
"       10.000   Pervious length"
"        6.000   Pervious slope"
"        0.041   Impervious Area"
"       10.000   Impervious length"
"        6.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.043     0.000     0.466     0.466 c.m/sec"
"            Catchment 304          Pervious   Impervious Total Area "
"            Surface Area           0.050      0.041      0.090      hectare"
"            Time of concentration  3.303      0.609      2.062      minutes"
"            Time to Centroid       86.064     80.932     83.699     minutes"
```

```
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        38.44      31.45      69.88      c.m"
"             Rainfall losses        10.672     7.675      9.324      mm"
"             Runoff depth           66.975     69.972     68.324     mm"
"             Runoff volume          33.15      28.34      61.49      c.m"
"             Runoff coefficient     0.863      0.901      0.880      "
"             Maximum flow           0.023      0.021      0.043      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.043     0.043     0.466     0.466"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.043     0.043     0.043     0.466"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.487    c.m/sec"
"             Hydrograph volume          1600.333    c.m"
"                    0.043     0.043     0.043     0.487"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.043     0.000     0.043     0.487"
" 33          CATCHMENT 305"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          305   External Drainage from 206"
"        0.000   % Impervious"
"        0.020   Total Area"
"       20.000   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"       20.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.010     0.000     0.043     0.487 c.m/sec"
"             Catchment 305          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  4.593      0.847      4.593      minutes"
"             Time to Centroid       87.733     81.042     87.733     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        15.53      0.00       15.53      c.m"
"             Rainfall losses        9.772      5.039      9.772      mm"
"             Runoff depth           67.875     72.608     67.875     mm"
"             Runoff volume          13.58      0.00       13.58      c.m"
"             Runoff coefficient     0.874      0.000      0.874      "
"             Maximum flow           0.010      0.000      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.010     0.010     0.043     0.487"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          206   Uncontrolled Sheet Flow"
"        0.000   % Impervious"
"        0.130   Total Area"
"       10.000   Flow length"
"        3.000   Overland Slope"
"        0.130   Pervious Area"
"       10.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.063     0.010     0.043     0.487 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  4.067      0.750      4.067      minutes"
"             Time to Centroid       87.085     80.945     87.085     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        100.94     0.00       100.94     c.m"
"             Rainfall losses        10.055     5.931      10.055     mm"
"             Runoff depth           67.592     71.716     67.592     mm"
"             Runoff volume          87.87      0.00       87.87      c.m"
"             Runoff coefficient     0.871      0.000      0.871      "
"             Maximum flow           0.063      0.000      0.063      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.063     0.073     0.043     0.487"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.063     0.073     0.073     0.487"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.556    c.m/sec"
"             Hydrograph volume          1701.778    c.m"
"                     0.063     0.073     0.073     0.556"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.063     0.000     0.073     0.556"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Site Development Area, Uncontrolled"
"       60.000   % Impervious"
"        0.260   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.104   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.129     0.000     0.073     0.556 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.104      0.156      0.260      hectare"
"             Time of concentration  1.858      0.343      0.957      minutes"
"             Time to Centroid       84.020     80.452     81.897     minutes"
"             Rainfall depth         77.647     77.647     77.647     mm"
"             Rainfall volume        80.75      121.13     201.88     c.m"
"             Rainfall losses        10.118     11.478     10.934     mm"
"             Runoff depth           67.530     66.169     66.713     mm"
```

```
"             Runoff volume          70.23      103.22     173.45     c.m"
"             Runoff coefficient     0.870      0.852      0.859      "
"             Maximum flow           0.051      0.079      0.129      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.129     0.129     0.073     0.556"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.129     0.129     0.129     0.556"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.649    c.m/sec"
"             Hydrograph volume         1875.233    c.m"
"                    0.129     0.129     0.129     0.649"
" 40          HYDROGRAPH   Confluence    1001"
"            7   Confluence "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.649    c.m/sec"
"             Hydrograph volume         1875.233    c.m"
"                    0.129     0.649     0.129     0.000"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              \\gamsby.local\gmprojects\Kitchener\"
"                418-2018\418223 - 1016-1018 Doering Street, Wellesley\Design
Data\Modelling Files\SWM Report\Post"
"                Output filename:                                 100yr_Post6.out"
"                Licensee name:                                             GMBP"
"                Company                                                       "
"                Date & Time last used:                 3/4/2021 at 12:54:52 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4688.000   Coefficient A"
"       17.000   Constant B"
"        0.962   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           236.711    mm/hr"
"             Total depth                  87.079    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   External Drainage to 201"
"       41.000   % Impervious"
"        0.370   Total Area"
"       15.000   Flow length"
"       10.000   Overland Slope"
"        0.218   Pervious Area"
"       15.000   Pervious length"
"       10.000   Pervious slope"
"        0.152   Impervious Area"
"       15.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.193     0.000     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.218      0.152      0.370      hectare"
"             Time of concentration  3.467      0.640      2.282      minutes"
"             Time to Centroid       85.976     80.691     83.762     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        190.09     132.10     322.19     c.m"
"             Rainfall losses        10.881     7.996      9.698      mm"
"             Runoff depth           76.198     79.083     77.381     mm"
"             Runoff volume          166.34     119.97     286.31     c.m"
"             Runoff coefficient     0.875      0.908      0.889      "
"             Maximum flow           0.115      0.087      0.193      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.193     0.193     0.000     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Site Drainage to CB4"
"       65.000   % Impervious"
"        0.240   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.084   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.133     0.193     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.084      0.156      0.240      hectare"
"             Time of concentration  1.782      0.329      0.849      minutes"
"             Time to Centroid       83.575     80.147     81.374     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        73.15      135.84     208.99     c.m"
"             Rainfall losses        10.242     12.869     11.950     mm"
"             Runoff depth           76.837     74.210     75.129     mm"
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"             Runoff volume          64.54      115.77     180.31     c.m"
"             Runoff coefficient     0.882      0.852      0.863      "
"             Maximum flow           0.046      0.087      0.133      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.133     0.326     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.133     0.326     0.326     0.000"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                 0.326    c.m/sec"
"             Hydrograph volume          466.621    c.m"
"                    0.133     0.326     0.326     0.326"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.133     0.000     0.326     0.326"
" 33          CATCHMENT 301"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          301   External Drainage to 203"
"        0.000   % Impervious"
"        0.010   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.010   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.005     0.000     0.326     0.326 c.m/sec"
"             Catchment 301          Pervious   Impervious Total Area "
"             Surface Area           0.010      0.000      0.010      hectare"
"             Time of concentration  4.564      0.842      4.564      minutes"
"             Time to Centroid       87.361     80.824     87.361     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
```

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"             Rainfall volume        8.71       0.00       8.71       c.m"
"             Rainfall losses        9.891      5.547      9.891      mm"
"             Runoff depth           77.189     81.532     77.189     mm"
"             Runoff volume          7.72       0.00       7.72       c.m"
"             Runoff coefficient     0.886      0.000      0.886      "
"             Maximum flow           0.005      0.000      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.005     0.005     0.326     0.326"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   North Swale"
"       50.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.035   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.035   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.039     0.005     0.326     0.326 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.035      0.035      0.070      hectare"
"             Time of concentration  1.782      0.329      1.068      minutes"
"             Time to Centroid       83.575     80.147     81.891     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        30.48      30.48      60.96      c.m"
"             Rainfall losses        10.242     12.869     11.556     mm"
"             Runoff depth           76.837     74.210     75.524     mm"
"             Runoff volume          26.89      25.97      52.87      c.m"
"             Runoff coefficient     0.882      0.852      0.867      "
"             Maximum flow           0.019      0.020      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.039     0.043     0.326     0.326"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                    0.039     0.043     0.043     0.326"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.370    c.m/sec"
"             Hydrograph volume           527.207    c.m"
"                    0.039     0.043     0.043     0.370"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.039     0.000     0.043     0.370"
" 33          CATCHMENT 302"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          302   External Drainage to 204"
"        0.000   % Impervious"
"        0.250   Total Area"
"       15.000   Flow length"
"        4.000   Overland Slope"
"        0.250   Pervious Area"
"       15.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.137     0.000     0.043     0.370 c.m/sec"
"             Catchment 302          Pervious   Impervious Total Area "
"             Surface Area           0.250      0.000      0.250      hectare"
"             Time of concentration  4.564      0.842      4.564      minutes"
"             Time to Centroid       87.361     80.824     87.361     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        217.70     0.00       217.70     c.m"
"             Rainfall losses        9.891      5.547      9.891      mm"
"             Runoff depth           77.189     81.532     77.189     mm"
"             Runoff volume          192.97     0.00       192.97     c.m"
"             Runoff coefficient     0.886      0.000      0.886      "
"             Maximum flow           0.137      0.000      0.137      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.137     0.137     0.043     0.370"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          204   Site Drainage to DCB2"
"       45.000   % Impervious"
"        0.090   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.050   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.041   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.050     0.137     0.043     0.370 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.041      0.090      hectare"
"             Time of concentration  1.782      0.329      1.141      minutes"
"             Time to Centroid       83.575     80.147     82.062     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        43.10      35.27      78.37      c.m"
"             Rainfall losses        10.242     12.869     11.424     mm"
"             Runoff depth           76.837     74.210     75.655     mm"
"             Runoff volume          38.03      30.06      68.09      c.m"
"             Runoff coefficient     0.882      0.852      0.869      "
"             Maximum flow           0.027      0.023      0.050      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.050     0.175     0.043     0.370"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.050     0.175     0.175     0.370"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"         1000   Node #"
"                Site Runoff to Pond"
"             Maximum flow                  0.529    c.m/sec"
```

```
"             Hydrograph volume           788.268    c.m"
"                    0.050     0.175     0.175     0.529"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.050     0.000     0.175     0.529"
" 33          CATCHMENT 303"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          303   External Drainage to 205"
"        0.000   % Impervious"
"        0.030   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.030   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.016     0.000     0.175     0.529 c.m/sec"
"             Catchment 303          Pervious   Impervious Total Area "
"             Surface Area           0.030      0.000      0.030      hectare"
"             Time of concentration  4.268      0.788      4.268      minutes"
"             Time to Centroid       86.990     80.756     86.990     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        26.12      0.00       26.12      c.m"
"             Rainfall losses        9.981      6.089      9.981      mm"
"             Runoff depth           77.098     80.991     77.098     mm"
"             Runoff volume          23.13      0.00       23.13      c.m"
"             Runoff coefficient     0.885      0.000      0.885      "
"             Maximum flow           0.016      0.000      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.016     0.016     0.175     0.529"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          205   Site Drainage to Swale"
```

```
"       50.000   % Impervious"
"        0.040   Total Area"
"        8.000   Flow length"
"       15.000   Overland Slope"
"        0.020   Pervious Area"
"        8.000   Pervious length"
"       15.000   Pervious slope"
"        0.020   Impervious Area"
"        8.000   Impervious length"
"       15.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.022     0.016     0.175     0.529 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.020      0.040      hectare"
"             Time of concentration  2.105      0.389      1.257      minutes"
"             Time to Centroid       84.015     80.379     82.219     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        17.42      17.42      34.83      c.m"
"             Rainfall losses        10.387     12.234     11.310     mm"
"             Runoff depth           76.692     74.846     75.769     mm"
"             Runoff volume          15.34      14.97      30.31      c.m"
"             Runoff coefficient     0.881      0.860      0.870      "
"             Maximum flow           0.011      0.011      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.022     0.035     0.175     0.529"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.022     0.035     0.035     0.529"
" 40          HYDROGRAPH   Combine    1000"
"            6   Combine "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.564    c.m/sec"
"             Hydrograph volume           841.705    c.m"
"                     0.022     0.035     0.035     0.564"
" 40          HYDROGRAPH   Confluence    1000"
"            7   Confluence "
"          1000   Node #"
"                 Site Runoff to Pond"
"             Maximum flow                  0.564    c.m/sec"
```

```
"             Hydrograph volume           841.705    c.m"
"                     0.022     0.564     0.035     0.000"
" 33          CATCHMENT 306"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          306   External Drainage to 200"
"        7.000   % Impervious"
"        0.070   Total Area"
"       30.000   Flow length"
"        7.000   Overland Slope"
"        0.065   Pervious Area"
"       30.000   Pervious length"
"        7.000   Pervious slope"
"        0.005   Impervious Area"
"       30.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.037     0.564     0.035     0.000 c.m/sec"
"             Catchment 306          Pervious   Impervious Total Area "
"             Surface Area           0.065      0.005      0.070      hectare"
"             Time of concentration  5.848      1.079      5.491      minutes"
"             Time to Centroid       89.034     81.127     88.441     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        56.69      4.27       60.96      c.m"
"             Rainfall losses        9.769      3.858      9.356      mm"
"             Runoff depth           77.310     83.221     77.724     mm"
"             Runoff volume          50.33      4.08       54.41      c.m"
"             Runoff coefficient     0.888      0.956      0.893      "
"             Maximum flow           0.035      0.003      0.037      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.037     0.591     0.035     0.000"
" 33          CATCHMENT 307"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          307   External Drainage to 200"
"       21.000   % Impervious"
"        0.180   Total Area"
"       10.000   Flow length"
```

```
"        4.000   Overland Slope"
"        0.142   Pervious Area"
"       10.000   Pervious length"
"        4.000   Pervious slope"
"        0.038   Impervious Area"
"       10.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.090     0.591     0.035     0.000 c.m/sec"
"             Catchment 307          Pervious   Impervious Total Area "
"             Surface Area           0.142      0.038      0.180      hectare"
"             Time of concentration  3.578      0.660      2.945      minutes"
"             Time to Centroid       86.139     80.691     84.957     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        123.83     32.92      156.74     c.m"
"             Rainfall losses        10.951     7.684      10.265     mm"
"             Runoff depth           76.128     79.395     76.814     mm"
"             Runoff volume          108.25     30.01      138.27     c.m"
"             Runoff coefficient     0.874      0.912      0.882      "
"             Maximum flow           0.075      0.022      0.090      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.090     0.681     0.035     0.000"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Site Development"
"       70.000   % Impervious"
"        0.900   Total Area"
"       10.000   Flow length"
"        5.000   Overland Slope"
"        0.270   Pervious Area"
"       10.000   Pervious length"
"        5.000   Pervious slope"
"        0.630   Impervious Area"
"       10.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
```

```
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.492     0.681     0.035     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.270      0.630      0.900      hectare"
"             Time of concentration  3.346      0.618      1.418      minutes"
"             Time to Centroid       85.789     80.689     82.184     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        235.11     548.60     783.71     c.m"
"             Rainfall losses        10.888     8.356      9.116      mm"
"             Runoff depth           76.191     78.723     77.963     mm"
"             Runoff volume          205.72     495.95     701.67     c.m"
"             Runoff coefficient     0.875      0.904      0.895      "
"             Maximum flow           0.142      0.359      0.492      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.492     1.173     0.035     0.000"
" 54          POND DESIGN"
"        1.173   Current peak flow    c.m/sec"
"        0.129   Target outflow    c.m/sec"
"       1736.0   Hydrograph volume    c.m"
"          23.   Number of stages"
"        0.000   Minimum water level    metre"
"        3.000   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                348.710     0.000     0.000"
"                348.810   0.02640    0.6000"
"                348.910   0.03730     1.200"
"                349.010   0.04570     2.450"
"                349.110   0.05280     4.170"
"                349.210   0.05900     6.000"
"                349.310   0.06470     7.910"
"                349.410   0.06990     8.660"
"                349.440   0.07130     9.030"
"                349.510    0.1865    48.060"
"                349.610    0.2535   103.470"
"                349.710    0.3031   158.990"
"                349.810    0.3447   214.590"
"                349.910    0.3812   270.130"
"                350.010    0.4143   325.130"
"                350.060    0.4298   352.880"
"                350.080    0.4359   353.230"
"                350.110    0.4448   371.700"
```

```
"               350.140    0.4535   399.470"
"               350.170    0.4620   436.720"
"               350.200    0.4704   477.160"
"               350.220    0.5143   477.510"
"               350.320    0.9381   478.520"
"            Peak outflow                  0.604    c.m/sec"
"            Maximum level               350.312    metre"
"            Maximum storage             478.434    c.m"
"            Centroidal lag                1.569   hours"
"                 0.492     1.173     0.604     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    1001"
"           6   Combine "
"         1001   Node #"
"               Total Site Runoff"
"            Maximum flow                  0.604    c.m/sec"
"            Hydrograph volume          1694.351    c.m"
"                    0.492     1.173     0.604     0.604"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.492     0.000     0.604     0.604"
" 33         CATCHMENT 304"
"           1   Triangular SCS"
"           1   Equal length"
"           2   Horton equation"
"          304   External Drainage to House 1016"
"       45.000   % Impervious"
"        0.090   Total Area"
"       10.000   Flow length"
"        6.000   Overland Slope"
"        0.050   Pervious Area"
"       10.000   Pervious length"
"        6.000   Pervious slope"
"        0.041   Impervious Area"
"       10.000   Impervious length"
"        6.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.048     0.000     0.604     0.604 c.m/sec"
"            Catchment 304          Pervious   Impervious Total Area "
"            Surface Area           0.050      0.041      0.090      hectare"
"            Time of concentration  3.168      0.585      1.989      minutes"
"            Time to Centroid       85.549     80.682     83.328     minutes"
```

```
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        43.10      35.27      78.37      c.m"
"             Rainfall losses        10.935     8.937      10.036     mm"
"             Runoff depth           76.144     78.142     77.043     mm"
"             Runoff volume          37.69      31.65      69.34      c.m"
"             Runoff coefficient     0.874      0.897      0.885      "
"             Maximum flow           0.026      0.023      0.048      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.048     0.048     0.604     0.604"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.048     0.048     0.048     0.604"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.627    c.m/sec"
"             Hydrograph volume          1763.690    c.m"
"                     0.048     0.048     0.048     0.627"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.048     0.000     0.048     0.627"
" 33          CATCHMENT 305"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          305   External Drainage from 206"
"        0.000   % Impervious"
"        0.020   Total Area"
"       20.000   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"       20.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.011     0.000     0.048     0.627 c.m/sec"
"             Catchment 305          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  4.405      0.813      4.405      minutes"
"             Time to Centroid       87.165     80.786     87.165     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        17.42      0.00       17.42      c.m"
"             Rainfall losses        9.937      5.827      9.937      mm"
"             Runoff depth           77.142     81.252     77.142     mm"
"             Runoff volume          15.43      0.00       15.43      c.m"
"             Runoff coefficient     0.886      0.000      0.886      "
"             Maximum flow           0.011      0.000      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.011     0.011     0.048     0.627"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          206   Uncontrolled Sheet Flow"
"        0.000   % Impervious"
"        0.130   Total Area"
"       10.000   Flow length"
"        3.000   Overland Slope"
"        0.130   Pervious Area"
"       10.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.070     0.011     0.048     0.627 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  3.901      0.720      3.901      minutes"
"             Time to Centroid       86.528     80.699     86.528     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        113.20     0.00       113.20     c.m"
"             Rainfall losses        10.452     6.877      10.452     mm"
"             Runoff depth           76.627     80.202     76.627     mm"
"             Runoff volume          99.62      0.00       99.62      c.m"
"             Runoff coefficient     0.880      0.000      0.880      "
"             Maximum flow           0.070      0.000      0.070      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.070     0.081     0.048     0.627"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.070     0.081     0.081     0.627"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                  0.673    c.m/sec"
"             Hydrograph volume          1878.734    c.m"
"                     0.070     0.081     0.081     0.673"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.070     0.000     0.081     0.673"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Site Development Area, Uncontrolled"
"       60.000   % Impervious"
"        0.260   Total Area"
"        7.000   Flow length"
"       20.000   Overland Slope"
"        0.104   Pervious Area"
"        7.000   Pervious length"
"       20.000   Pervious slope"
"        0.156   Impervious Area"
"        7.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"        6.000   Pervious Max.infiltration"
"        1.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.144     0.000     0.081     0.673 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.104      0.156      0.260      hectare"
"             Time of concentration  1.782      0.329      0.923      minutes"
"             Time to Centroid       83.575     80.147     81.547     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        90.56      135.84     226.41     c.m"
"             Rainfall losses        10.242     12.869     11.818     mm"
"             Runoff depth           76.837     74.210     75.261     mm"
```

```
"             Runoff volume          79.91      115.77     195.68     c.m"
"             Runoff coefficient     0.882      0.852      0.864      "
"             Maximum flow           0.057      0.087      0.144      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.144     0.144     0.081     0.673"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.144     0.144     0.144     0.673"
" 40          HYDROGRAPH   Combine    1001"
"            6   Combine "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.735    c.m/sec"
"             Hydrograph volume         2074.412    c.m"
"                    0.144     0.144     0.144     0.735"
" 40          HYDROGRAPH   Confluence    1001"
"            7   Confluence "
"         1001   Node #"
"                Total Site Runoff"
"             Maximum flow                 0.735    c.m/sec"
"             Hydrograph volume         2074.412    c.m"
"                    0.144     0.735     0.144     0.000"
```

APPENDIX D

Oil and Grit Separator Design and Details

ADS OGS Sizing Summary

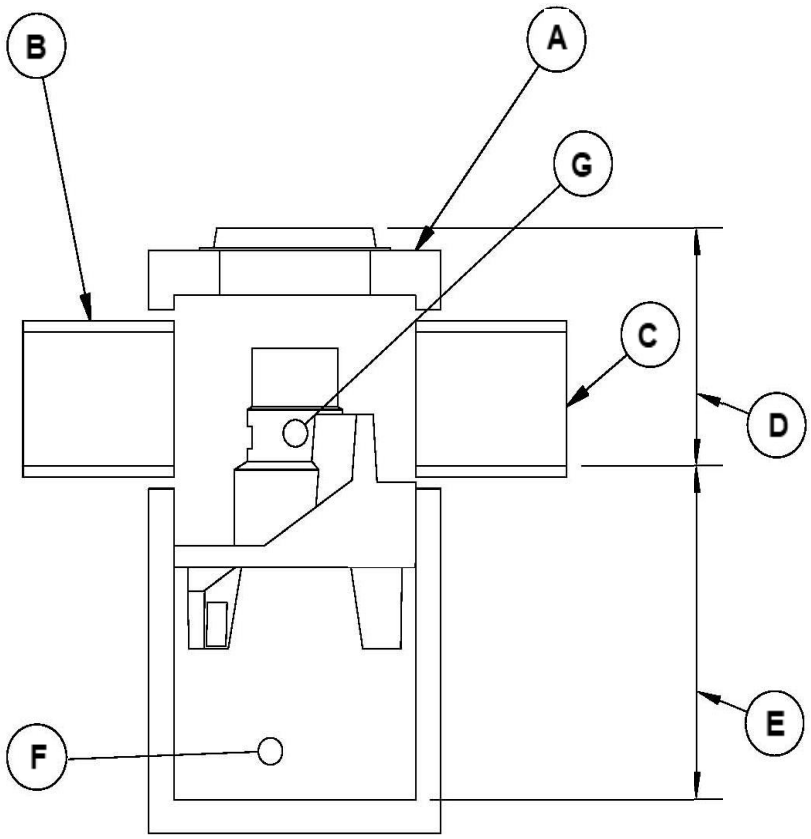
Project Name:	1016 & 1018 Doering St		
Consulting Engineer:	GM Blueplan		
Location:	Wellesley, ON		
Sizing Completed By:	C. Neath	**Email:**	cody.neath@ads-pipe.com

Treatment Requirements		
Treatment Goal:	Enhanced (MOE)	
Selected Parameters:	80% TSS	90% Volume
Selected Unit:	**FD-4HC**	

Site Details	
Site Area:	2.5 ha
% Impervious:	52%
Rational C:	0.61
Rainfall Station:	Waterloo_Wellington
Particle Size Distribution:	Fine
Peak Flowrate:	--- L/s

Summary of Results		
Model	**TSS Removal**	**Volume Treated**
FD-4HC	81.5%	97.7%
FD-5HC	85.4%	99.3%
FD-6HC	87.9%	99.7%
FD-8HC	91.8%	99.9%

FD-4HC Specification	
Unit Diameter (A):	1,200 mm
Inlet Pipe Diameter (B):	450 mm
Outlet Pipe Diameter (C):	450 mm
Height, T/G to Outlet Invert (D):	1490 mm
Height, Outlet Invert to Sump (E):	1,500 mm
Sediment Storage Capacity (F):	0.78 m³
Oil Storage Capacity (G):	723 L
Recommended Sediment Depth for Maintenance:	440 mm
Max. Pipe Diameter:	600 mm
Peak Flow Capacity:	510 L/s



Site Elevations:	
Rim Elevation:	350.19
Inlet Pipe Elevation:	348.70
Outlet Pipe Elevation:	348.70

Notes:

Removal efficiencies are based on NJDEP Test Protocols and independently verified.

All units supplied by ADS have numerous local, provincial, and international certifications (copies of which can be provided upon request). The design engineer is responsible for ensuring compliance with applicable regulations.

Project Name:	1016 & 1018 Doering St
Consulting Engineer:	GM Blueplan
Location:	Wellesley, ON

Net Annual Removal Efficiency Summary: FD-4HC

Rainfall Intensity[1]	Fraction of Rainfall[1]	FD-4HC Removal Efficiency[2]	Weighted Net-Annual Removal Efficiency
mm/hr	%	%	%
0.50	0.3%	97.0%	0.3%
1.00	27.0%	90.9%	24.5%
1.50	3.2%	87.6%	2.8%
2.00	13.6%	85.3%	11.6%
2.50	7.2%	83.5%	6.0%
3.00	1.8%	82.1%	1.5%
3.50	6.7%	80.9%	5.4%
4.00	3.7%	79.9%	3.0%
4.50	1.5%	79.1%	1.2%
5.00	4.8%	78.3%	3.7%
6.00	3.3%	77.0%	2.6%
7.00	4.7%	75.9%	3.6%
8.00	2.8%	74.9%	2.1%
9.00	2.0%	74.1%	1.5%
10.00	2.5%	73.4%	1.9%
20.00	9.0%	68.8%	6.2%
30.00	3.1%	66.3%	2.1%
40.00	1.0%	64.5%	0.6%
50.00	0.8%	63.2%	0.5%
100.00	0.9%	59.3%	0.5%
150.00	0.1%	57.1%	0.1%
200.00	0.0%	55.6%	0.0%
		Total Net Annual Removal Efficiency:	81.5%
		Total Runoff Volume Treated:	97.7%

Notes:

(1) Rainfall Data: 1981:2007,HLY03 6149387, Waterloo/Wellingotn Airport, ON

(2) Based on third party verified data and appoximating the removal of a PSD similar to the STC Fine distribution

(3) Rainfall adjusted to 5 min peak intensity based on hourly average.